Operator's Manual

Auto Syringe AS50

Model AS50 Infusion Pump

Baxter

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Warning

There are risks associated with using anything other than the recommended IV extension sets with this device. Sets designated for use with this device are identified in the section “Simplified Instructions”. Baxter’s warranty on this device will be null and void and Baxter will assume no responsibility for incidents which may occur if the product is not used in accordance with product labeling. See the section “Precautions” for a complete list of warnings and cautions.

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About This Manual

The Auto Syringe AS50 Infusion Pump Operator's Manual is intended for use by trained healthcare professionals familiar with infusions and infusion pump procedures.

Notations Used in this Manual

Note: Important information is preceded by the word "Note" in boldface type.

BOLD ITALIC TEXT	Denotes text prompts as they appear on the pump's status display. For example, ***ML/HR*** is the text that appears on the bottom line of the status display when selecting the mL/hr infusion mode.
BOLD TEXT	Denotes the keys on the pump's keypad. For example, the text "press **123**, **CONFIRM**" means: press the keys labeled "1," "2," and "3," and then press the key labeled "**CONFIRM**."
(hh:mm)	Denotes hours and minutes. The left two digits represent hours, and the right two digits represent minutes.

Important precautions are denoted by an exclamation point enclosed in a triangle, as shown below:

IMPORTANT: Read and understand all operating instructions and the "Precautions" on page 5 before using the Auto Syringe AS50 Infusion Pump.

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Device Description

The Auto Syringe AS50 Infusion Pump (hereinafter referred to as “the pump”) is designed to meet the fluid and drug delivery requirements of today’s changing clinical environment. It provides accurate, continuous or intermittent infusion of intravenous solutions, drug solutions, whole blood, and packed red blood cells.

The pump is indicated for infusion via intravenous (IV), intra-arterial (IA), epidural, or subcutaneous routes of administration. It can be piggybacked into an ongoing infusion line to deliver secondary solutions automatically, precisely, and economically. Infusion rates are programmable from 0.01 to 438 mL/hr.

The pump accepts standard disposable syringes from 1 mL to 60 mL in size. A numeric keypad simplifies programming and makes the pump easy to use. During programming, the status display prompts the user to enter data about the syringe and the infusion. While the pump is running, the status display shows information about the infusion. Safety and effectiveness are reinforced by pre-programmable bolus operation, titration of a dose without interruption of fluid flow, and easily understood alarm and alert messages.

The pump includes an optional serial communication feature, which provides remote computer control and monitoring capabilities. A standard 9-pin connector allows an RS-232 communication link between the pump and the host computer. The “Auto Syringe AS50 Infusion Pump Programmer’s Manual” describes the use of this feature.

The pump can be custom-configured to select key features that meet specific requirements. Configurable options include:

- Audio range
- Auto default to previous mode
- Backlight
- Infusion mode selections
- Keypad auto lock
- Maximum infusion rates
- Occlusion pressure sensitivity
- Protocol library
- Remote computer control
- Syringe manufacturer, type and size selections

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The selected options can easily be reviewed and the chosen configuration can be changed to meet new or different requirements.

The pump operates on an internal rechargeable battery pack and can also be operated while attached to a “900-Series” battery charger (model number CAS40-01-900) or to a Multi-Charger (product code 1M8563).

The pump is supplied with a pole clamp and a built-in IV pole loop. The pump can also be used on a tabletop.

Information on writing custom software for the pump is available in the Auto Syringe AS50 Infusion Pump Programmer’s Manual. Information on troubleshooting and repair of the pump is available in the Auto Syringe AS50 Infusion Pump Service Manual.

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Precautions

Federal (USA) law restricts this device to sale by or on the order of a physician.

The charger port is to be used only with “900 Series” chargers or other accessories that are labeled specifically for use with Auto Syringe AS40A or AS50 Series Infusion Pumps, including the 1M8563 Multi-Charger.

CAUTION: Refer all service, repair, and calibration to qualified technical personnel.

CAUTION: Do not operate the Auto Syringe AS50 Infusion Pump in the presence of flammable anesthetics, oxygen-enriched, or explosive atmospheres.

- Though the factory-supplied configuration settings are suitable for most therapies, the operator and hospital professionals should verify that the pump’s settings are appropriate for the clinical application.
- The Protocol Library feature is a configuration option developed to facilitate infusion programming. Before using a protocol for any specific drug, refer to the full prescribing information supplied by the drug manufacturer.
- As with all medical electronic equipment, care must be exercised to avoid exposing this device to powerful sources of electromagnetic interference.
- Do not expose the pump to X-rays, gamma rays, or other ionizing radiation, or to strong electric or magnetic fields.
- Do not autoclave, steam sterilize, EtO sterilize, or subject the pump or charger to temperatures in excess of 104° F (40° C).
- Do not use the following chemicals on the device, as they will damage the front panel: acetone, acetoaldehyde ammonia, benzene, hydroxytoluene, methylene chloride, and ozone, Do not use cleaners containing n-alkyl dimethyl ethylbenzyl ammonium chloride unless they appear in the list of recommended cleaners in the Pump Maintenance section of this manual.
- Do not use hard or sharp objects on the keypad.

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- If a ***LINE OCCLUDED*** alarm occurs, RELIEVE THE RESIDUAL PRESSURE IN THE SYRINGE BY RELEASING THE PLUNGER DRIVER. If the pressure is not relieved prior to clearing the occlusion, an unintentional bolus delivery may occur when the blockage is cleared. Check for kinked tubing, clogged catheter, closed stopcocks, etc. Check for foreign material preventing movement of the pump mechanism.

- Be sure to PURGE THE SYSTEM OF ALL AIR BEFORE ADMINISTERING ANY MEDICATION. Failure to follow this normal infusion procedure could precipitate serious consequences.

- Remember that the volume of fluid contained in the connecting tubing is a residual amount and cannot be infused. Allow for this extra volume of fluid when initially filling the syringe.

- In MANUAL SCHEDULE mode, **START** must be pressed to deliver each dose and continue the infusion regimen. Pressing any other key silences the audio portion of the ***DOSE DUE*** alarm and leaves the pump in Standby state, without initiating a dose delivery.

- Although extreme care has been taken in assembly, component selection, and quality control during manufacture of the Auto Syringe AS50 Infusion Pump, routine checks and maintenance procedures must be performed so that patients receiving infusions can be assured of trouble-free operation.

- Caution must be exercised in the selection of drugs intended to be delivered via any infusion pump. If the drug contained in the syringe will be exposed to extreme environmental conditions for prolonged time periods, IT IS IMPORTANT TO SELECT DRUGS THAT WILL NOT CHANGE PHARMACOLOGICALLY UPON SUCH EXPOSURE.

- As with all automatic infusion devices, whenever a TOXIC OR DANGEROUS LEVEL of drug is stored in the reservoir, CONSTANT MONITORING of the infusion is required.

- CAUTION must be employed to assure that the Auto Syringe AS50 Infusion Pump is in good working order before putting it into use. If the pump is being operated on battery power alone, ensure that the battery has been charged as described in this manual.

- When the pump is first turned on, verify that the Lamp Test is accurate (see “Display, Battery, and Syringe Sensor Check” on page 75).

- Verify all program data before pressing **START**.

- Wipe off spills immediately. Do not allow fluid or residues to remain on the pump.

- Repeated incorrect identification of syringe size by Syringe Recognition may signify a pump fault condition, or that a syringe manufacturer has made a dimensional change. The pump should be removed from service as soon as possible, so that the problem can be investigated.

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- If the Size Override configuration option is enabled, an operator can manually override the Syringe Recognition feature. Incorrect syringe information may cause delivery errors.

Special Precautions for Epidural Administration

- Epidural administration of anesthetics is limited to short-term infusion (not to exceed 96 hours) with indwelling catheters specifically indicated for short-term anesthetic epidural drug delivery.
- Epidural administration of analgesics is limited to use with indwelling catheters specifically indicated for either short- or long-term analgesic epidural drug delivery.
- To prevent infusion of drugs that are not indicated for epidural use, do not use IV extension sets that incorporate injection sites during epidural delivery.
- It is strongly recommended that pumps used for epidural drug delivery be clearly differentiated from pumps used for other routes of administration.

WARNING: Epidural administration of drugs other than those indicated for epidural use could result in serious injury to the patient.

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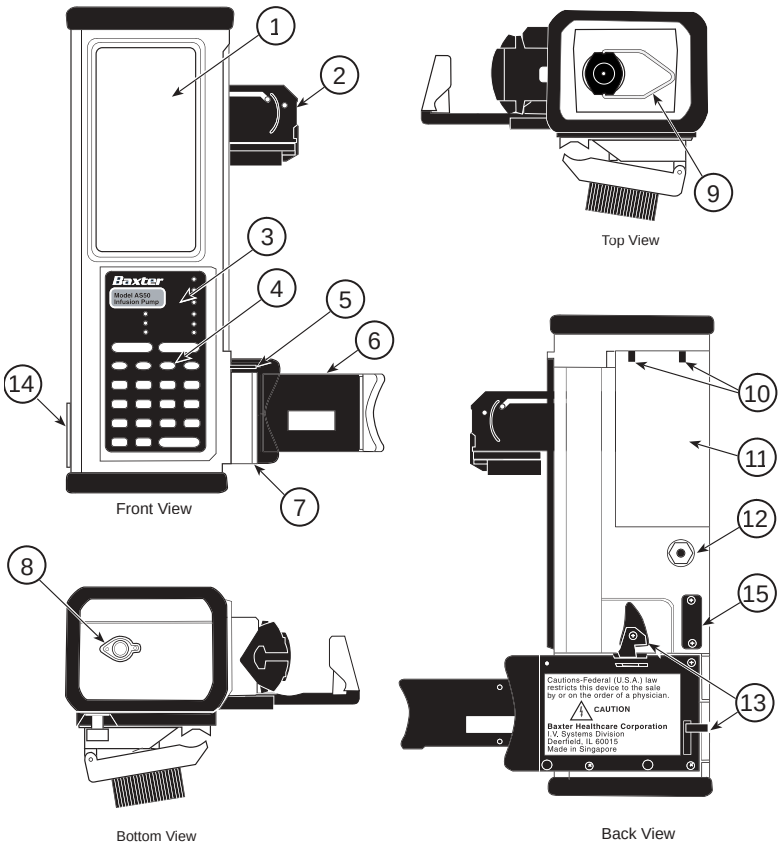
Simplified Instructions

Operation

Refer to the figure below for the location and description of the pump's operating controls. The item numbers shown in the figure are referenced throughout the operating instructions also.

1. Status Display
2. Plunger Assembly (Finger Grip, Plunger Clamp, Plunger Driver)
3. Status Panel
4. Keypad
5. Flange Slot
6. Barrel Clamp
7. Cradle
8. Charger Port
9. IV Pole Loop
10. Pole Clamp Mounting Pins
11. Battery Cover
12. Pole Clamp Attach Recess
13. Barrel Clamp Release Levers
14. **ON/OFF** Switch
15. DB-9 RS-232 Serial Communication Port



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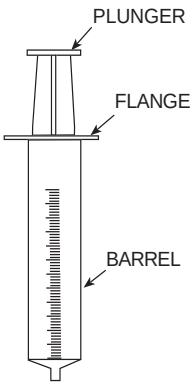
Note: Steps 1 and 2 can be performed after programming the pump if necessary (for example, if using CUSTOM DILUTION mode).

1. Attach an IV extension set to the syringe and manually purge the air from the filled syringe and tubing. Baxter recommends the following IV extension sets.

Catalog Number	Description
2N3345	36” Micro-Volume IV extension set
2N3346	36” High Flow Rate IV extension set
2N3347	36” Micro-Volume IV extension set with 0.22 micron filter
2N3348	60” Micro-Volume IV extension set
2N3349	60” High Flow Rate IV extension set
2N3350	60” Micro-Volume IV extension set with 0.22 micron filter



2. Mount the syringe on the pump.
   - Pull out the plunger driver (2), slide it to top of the pump, and release it.
   - Using the lever (13) on the side or rear of the pump, release the barrel clamp (6).
   - Place the syringe in the cradle (7), making sure the syringe flange fits into the slot (5).
   - Close the barrel clamp (6) firmly against the syringe barrel.
   - Pull out the plunger driver (2), slide it down to capture the top of the syringe plunger, and push in firmly to capture syringe plunger.
3. Slide the **ON/OFF** switch (14) to the **ON** position.
4. Program the pump (see “Programming” on page 11).
5. Purge the syringe and tubing again to remove slack from the plunger driver.
   - Press **PURGE**, **START** to begin purging. Repeat if necessary.
   - Press **STOP** if necessary to stop purging.
6. Connect the IV extension set to the patient.
7. Press **START** to begin the infusion.

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Programming

Note: If the Protocol Library feature is enabled, a ▲▼ ***SELECT LIBRARY*** prompt is displayed first. Use ▲, ▼ and **CONFIRM** as required to select a protocol library. Next, select a protocol from the library.

If the selected protocol specifies a default infusion mode, the pump skips step 1.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ as necessary to display the available infusion mode selections. Press **CONFIRM** to select an infusion mode.
2. Select the syringe manufacturer and size using ▲ or ▼ as necessary and complete the data entry by pressing **CONFIRM**. (For use of the Size Override feature, see “Size Override” on page 64.)
3. Enter the remaining program data as required. The current field is the one that is flashing.
   - Press number keys to enter the desired value.
   - Press **CONFIRM** to complete the data entry.
4. To change programmed data:
   - Press ▲ or ▼ to move to the desired field.
   - Press **EDIT**. The current value flashes.
   - Press ▲, ▼, or number keys to change the value.
   - Press **CONFIRM** to complete the data entry.
5. To program or edit the bolus size:
   - Press **BOLUS**, **EDIT**.
   - Set the bolus size using the number keys.
   - Press **START** to deliver a bolus, or **CONFIRM** to store the bolus size.
6. To clear the Total Delivered display:
   - Use ▲ or ▼ to move to the TOTAL mL field.
   - Press **EDIT**, **CLR** to reset the total to 0.00.

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Programming the Continuous Infusion Modes

Programming for each infusion mode proceeds in the sequence shown in the following table, in top-to-bottom order.

Continuous Infusion Modes

Step	mL/hr mL/min	Units/hr Units/min mUnits/hr mUnits/min	mcg/min mcg/hr mg/min mg/hr	mcg/kg/min mcg/kg/hr mg/kg/min mg/kg/hr	CUSTOM DILUTION
1	Select mode, syringe manufacturer, syringe size.	Select mode, syringe manufacturer, syringe size.	Select mode, syringe manufacturer, syringe size.	Select mode, syringe manufacturer, syringe size.	Select mode, syringe manufacturer, syringe size.
2					Enter target rate in mL/hr.
3				Enter body weight in kg.	Enter body weight in kg.
4		Enter drug concentration in Units/mL.	Enter drug concentration in mg/mL.	Enter drug concentration in mg/mL.	Enter drug concentration in mg/mL.
5	Enter infusion rate in mL/hr or mL/min.	Enter dose in Units/hr, Units/min, mUnits/hr, or mUnits/min.	Enter dose in mcg/hr, mcg/min, mg/hr, or mg/min.	Enter dose in mcg/kg/hr, mcg/kg/min, mg/kg/hr, or mg/kg/min.	Enter target dose in mcg/kg/min.
6					Enter final volume in mL.
7	Enter volume limit in mL.				See last Note below.
8	Enter bolus size in mL.	Enter bolus size in Units.	Enter bolus size in mg.	Enter bolus size in mcg/kg or mg/kg.	Enter bolus size in mcg/kg.

Notes:

- **mL** = milliliters, **kg** = kilograms, **mg** = milligrams, **mcg** = micrograms, **mUnits** = milliunits.
- If the Protocol Library feature is active, these modes can be accessed directly by selecting ***NONE*** (if available) at the ***SELECT LIBRARY*** or ***SELECT PROTOCOL*** programming step.
- The mode, rate, concentration, dose, bolus size, and maximum bolus rate may be initialized automatically if a protocol is selected.
- Bolus programming is optional. Bolus programming may be disallowed if a protocol is selected.

Note: Custom Dilution mode:

- Press **CONFIRM** to acknowledge the displayed Drug Volume. Mix the indicated drug volume with sufficient IV fluid to produce the Final Volume and fill the syringe. Follow manual purging and mounting procedures (see “Operation” on page 9).

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Programming the Timed Infusion Modes

Programming for each infusion mode proceeds in the sequence shown in the following table, in top-to-bottom order.

Timed Infusion Modes

Steps	SINGLE DOSE	MANUAL SCHEDULE	AUTO SCHEDULE
1	Select mode, syringe manufacturer, syringe size.	Select mode, syringe manufacturer, syringe size.	Select mode, syringe manufacturer, syringe size.
2	***INFUSE*** field: Enter dose in mL.	***INFUSE*** field: Enter dose in mL.	***INFUSE*** field: Enter dose in mL.
3	***OVER*** field: Enter dose duration in hours and minutes (hh:mm).	***OVER*** field: Enter dose duration in hours and minutes (hh:mm).	***OVER*** field: Enter dose duration in hours and minutes (hh:mm).
4		***EVERY*** field: Enter dose Interval in hours and minutes (hh:mm).	***EVERY*** field: Enter dose Interval in hours and minutes (hh:mm).
5		***NEXT DOSE IN*** field: Enter delay to start of first dose in hours and minutes (hh:mm). To start the first dose without delay, program ***NEXT DOSE IN*** field to ***0:00***.	***NEXT DOSE IN*** field: Enter delay to start of first dose in hours and minutes (hh:mm). To start the first dose without delay, program ***NEXT DOSE IN*** field to ***0:00***.
6		When the ***DOSE DUE*** alarm occurs, press **START** to deliver one dose.	

Note:

- If the Protocol Library feature is active, these modes can be accessed directly by selecting ***NONE*** (if available) at the ***SELECT LIBRARY*** or ***SELECT PROTOCOL*** programming step.

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Technical Specifications

Model:	Auto Syringe AS50 Infusion Pump
Catalog Code:	1M8550
Size:	approx. 3.4" x 2.6" x 10" (8.6 x 6.7 x 25 cm)
Weight:	approx. 3.2 lb. (1.45 kg)
Flow Rate Accuracy:	± 3% of full scale plunger travel (not including syringe tolerance)
Volume Accuracy:	± 3%, or ± 0.007" of travel, whichever is greater (not including syringe tolerance)
Syringes:	B-D 1, 3, 5, 10, 20, 30, 60 mL plastic Sherwood Monoject 1, 3, 6, 12, 20, 35, 60 mL Terumo 1, 3, 5, 10, 20, 30, 60 mL
Flow Rate Range:	0.01 mL/hr to 438 mL/hr, depending on the syringe
Deliverable Volume:	Full syringe volume for 1-60 mL syringes
Data Display:	Self-prompting, multi-field LCD (Liquid Crystal Display)
Status Display:	Nine-LED (Light Emitting Diode) array
Power Requirement:	AC: 105-125V 60 Hz (battery charger) DC: internal rechargeable battery pack
Battery Operating Time:	5 hours of operation at 100 mL/hr, or 12 hours of operation at 2 mL/hr using a 60 mL syringe, following a charge of no less than 16 hours.
Temperature Range:	50^{o} F to 104^{o} F (10^{o} C to 40^{o} C) Delivery of high viscosity fluids at low temperatures is not recommended.
Keypad:	Elastomeric type, with tactile feedback
Construction:	Water-resistant, high-impact plastic case with removable elastomeric protective bumpers

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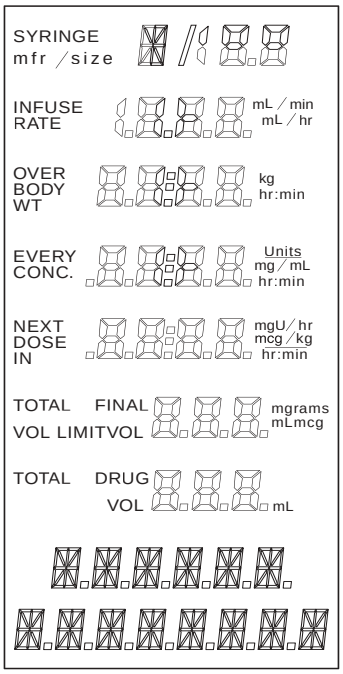
The Status Display

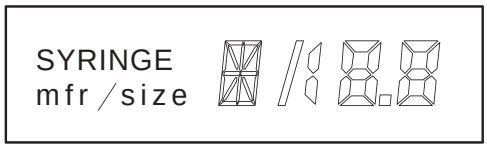


The status display has eight information areas, called *fields*. Except for the text field at the bottom, each field displays three types of information:

- The markings on the left and right side of each field are called *annunciators*. The left annunciators identify the type of data contained in the field, while the right annunciators identify the units of measure.
- The central portion of each field displays variable numeric data, either decimal numbers or time. This data generally represents either infusion program information or an active display such as a running total of the amount of drug infused.
- The bottom field of the status display is a two-line text display, used to prompt the programming sequence or to display a message about the infusion.

After the infusion mode has been selected, the pump automatically displays the necessary fields to be programmed. When the pump needs information, it provides a text prompt and flashes the current field.

Note: The pump's backlight is on whenever the charger is connected and the pump is switched on. The pump can also be configured to turn the backlight on for a specified time (0 to 60 minutes) after each keypress when the charger is not connected. See the Auto Syringe AS50 Infusion Pump Technical Manual for details.

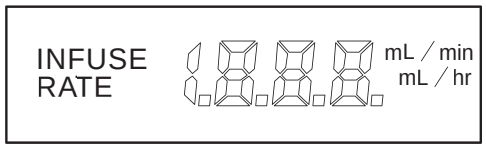


Field #1 displays the syringe manufacturer code and syringe size in mL.

[B] = B-D

[M] = Monoject

[T] = Terumo



Field #2 displays the volume to be infused (mL), or the infusion rate (mL/hr or mL/min).

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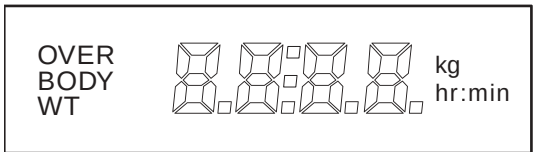
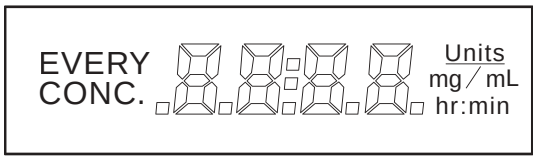
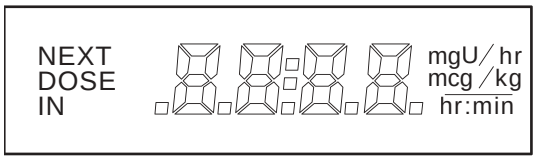
Field #3 displays dose duration (***HH:MM***), or patient body weight (kg).



Field #4 displays dose interval (***HH:MM***), drug concentration (mg/mL, or U/mL), or bolus size (Units or mL).



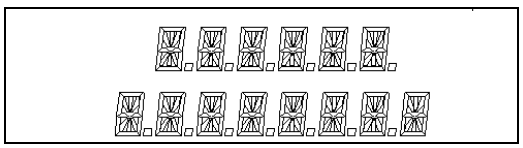
Field #5 displays time remaining until the next dose is due (hh:mm), dose size (mcg/min, mcg/hr, mg/min, mg/hr, mcg/kg/min, mcg/kg/hr, mg/kg/min, mg/kg/hr, mU/min, mU/hr, U/min, or U/hr) or bolus size (mg, mcg/kg, mg/kg, or Units).



Field #6 displays total delivered (mL, mcg, mg, or grams), volume limit (mL), bolus size (mL), or final volume (mL).

Field #7 displays total delivered (mL), or drug volume to be mixed with infusion base solution (mL).

Field #8 displays text prompts and messages.



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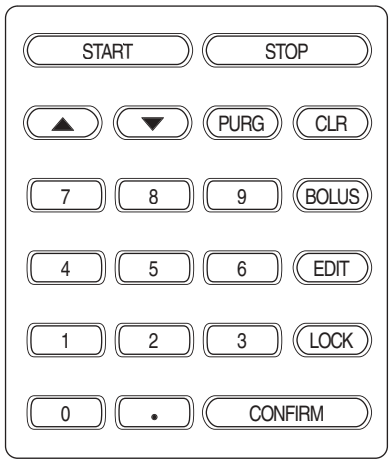
The Keypad

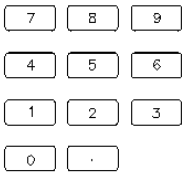


The keypad includes a standard set of number keys and decimal point (referred to in this document as digit keys), arrow keys, and various function keys.

Arrow Keys

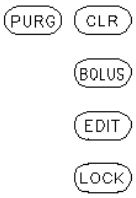
The up arrow key (▲) increases a number, selects a different field, or displays the next item in a list.
The down arrow key (▼) decreases a number, selects a different field, or displays the previous item in a list.

Digit Keys



The digit keys are used to enter numeric values directly.

Function Keys

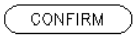


These keys activate specific functions.

Action Keys

These keys start and stop the pump motor.

Confirm Key



This key is used to complete a programming step, to respond to a prompt, or to display additional infusion program information.

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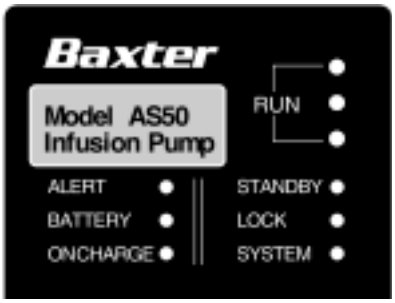
The Status Panel

RUN lights

When the pump is in the Run state, one or more of the green **RUN** lights are on.



When the pump is infusing, the three **RUN** lights flash in sequence, in a “falling drop” pattern.

When the pump is counting time until an infusion is to begin, only the top **RUN** light flashes.

When a bolus or purge is in progress, all three **RUN** lights flash simultaneously.

ALERT

The red **ALERT** light flashes during an alert or alarm. The status display and remaining status lights may display additional information.

BATTERY

When flashing, the red **BATTERY** light indicates that the battery charge is low. If the battery discharges significantly, the **BATTERY** light stays on constantly and the pump goes into a fail-safe alarm state.

ON CHARGE

The green **ON CHARGE** light indicates that the battery charger is plugged in.

STANDBY

The yellow **STANDBY** light flashes to indicate that the pump is in Standby state.

LOCK

The yellow **LOCK** light indicates that the keypad is locked.

SYSTEM

The red **SYSTEM** light indicates a malfunction. The pump cannot operate until the problem is corrected. The infusion must then be reprogrammed.

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Operating States

Standby State

When the pump is in Standby state, the infusion is stopped and the **STANDBY** light flashes. If the pump is left in Standby state for more than two minutes, a ***PUMP IS IDLE*** alert or alarm occurs.

Run State

There are two Run states: Run Delivering state and Run Counting state.

In Run Delivering state, the infusion program is running and the pump is delivering an infusion. The three **RUN** lights flash in a “falling drop” pattern.

In Run Counting state, the infusion program is counting time until the next dose is due, and the pump is not delivering an infusion. The top **RUN** light flashes.

Note: Bolus and Purge operations are special infusion states. The **RUN** lights flash in unison when bolusing or purging in both Standby and Run states.

Data Display and Entry

Numeric Data	Numbers are displayed in a right-justified format. A leading zero appears before decimal values when the field size permits. For example, the value “.12” is displayed as ***0.12***.
Time Data Fields	In time fields, values are displayed right justified. Leading zero(es) are automatically entered if needed. For example, 1 minute is entered by pressing **1**, **CONFIRM** and is displayed as ***0:01***.
Automatic Decimal	If a number is entered without a decimal point, the pump automatically enters a decimal point to the right of the number when **CONFIRM** is pressed.
Flashing Data	The data within a field flashes to show that the field has been opened and is ready to be programmed or edited.
Flashing Annunciators	The annunciators for the current field flash. The current field will be opened for editing when **EDIT** is pressed.
Data Test	All entered data is tested when **CONFIRM** is pressed. If the entered value is too large or too small, the pump issues a ***PUMP LIMIT*** alert and substitutes the nearest acceptable value. Press **CONFIRM** to accept the value, or enter a different value.

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Arrow Keys — Arrow keys can be used instead of individual digits for selecting predefined responses, incrementing or decrementing fields. In general, arrow keys cannot be used to initialize fields that have been cleared to dashes, except for syringe size and manufacturer fields.

Key Sounds — An audible click provides confirmation of each keypress. The pump indicates an invalid keypress by sounding a short beep. Simultaneous keypresses are ignored.

Dashes — Dashes are displayed when a field is clear and open for programming. In general, digit keys must be used to enter a value in a dashed field. If an arrow key is pressed while dashes are displayed, the pump beeps and displays the message ***USE DIGITS***.

Protocol Library Feature

The Protocol Library feature is a configurable option that allows authorized personnel to store named sets or protocols of frequently used programming data. Protocols may also be grouped into libraries.

Using a protocol can simplify the programming process by providing default selections at some of the data entry steps. For instructions on selecting a protocol, see “Using Protocols” on page 32.

The Protocol Library feature is enabled or disabled through the pump configuration mode. This procedure can be done by authorized personnel on site, and is described in the Auto Syringe AS50 Infusion Pump Service Manual.

A protocol may specify any of the following:

Default Infusion Mode — If a protocol specifies a default infusion mode, the infusion mode programming step is skipped. The pump briefly displays the infusion mode name before proceeding directly to the syringe manufacturer programming step.

Default Concentration — If a protocol specifies a default concentration, the default value appears automatically at the start of the concentration programming step. This value may be changed, or it may be accepted by pressing **CONFIRM**.

Default Dose or Rate — If a protocol specifies a default dose or rate, the default value appears automatically at the start of the ***ENTER DOSE*** or ***ENTER RATE*** programming step. This value may be changed, or it may be accepted by pressing **CONFIRM**.

Bolus Prevention — If a protocol specifies bolus prevention, the pump will not allow a bolus to be programmed or delivered. If **BOLUS** is pressed, the pump beeps and displays the message ***NOT ALLOWED***.

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Default Bolus Size	If a protocol specifies a default bolus size, the default value appears automatically when the Bolus Size field is first opened for editing. This value may be changed, or it may be accepted by pressing **CONFIRM**.
Bolus Maximum Rate	The bolus delivery rate is normally limited to the smaller of: the limit specified by the RATE RANGE configuration option, or the maximum rate for the programmed syringe. If a protocol specifies a bolus maximum rate, the pump will further limit the bolus delivery rate so it does not exceed the specified bolus maximum rate, which is defined in terms of dosage (such as mcg/kg/min).

Bypassing the Protocol Library Feature

Note: The ***NONE*** selection may not be available, depending upon configuration.

Selecting ***NONE*** at the ***SELECT LIBRARY*** or ***SELECT PROTOCOL*** step bypasses the Protocol Library feature and allows infusion mode selection and programming to proceed in the normal way.

Serial Communication Feature

The pump provides remote control and monitoring capabilities. A standard 9-pin connector (DB9) allows the connection of an RS-232 cable between the pump and a computer. The cable allows an operator at a remote computer to control pump operations and to query the pump for data such as infusion totals, program values, and operational status. The remote control feature is a configurable option. See the Auto Syringe AS50 Infusion Pump Programmer's Manual for details.

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Infusion Modes

The pump provides 18 infusion modes, which fall into two major categories: continuous and timed infusions. Continuous infusions deliver at a steady, programmed rate. Timed infusions deliver one or more equal doses according to a programmed schedule. The infusion modes are briefly described below. For more information see “Detailed Instructions” on page 27.

Continuous Infusion Modes

mL/hr and mL/min: The rate of infusion is programmed in mL/hr or mL/min, depending on the mode selected. A volume limit can be programmed for these modes only.

Units/hr, Units/min, mUnits/hr and mUnits/min: The drug concentration is entered in units/mL, and the dose is entered in Units/hr, Units/min, mUnits/hr or mUnits/min, depending on the mode selected. The pump automatically displays the effective rate in mL/hr.

mg/hr, Mg/min, mcg/hr and mcg/Min: The drug concentration is entered in mg/mL, and the dose is entered in mg/hr, mg/min, mcg/hr or mcg/min, depending on the mode selected. The pump automatically displays the effective rate in mL/hr.

mg/kg/hr, mg/kg/min, mcg/kg/hr and mcg/kg/min: The patient's body weight is entered in kg, the drug concentration is entered in mg/mL, and the dose is entered in mg/kg/hr, mg/kg/min, mcg/kg/hr or
mcg/kg/min, depending on the mode selected. The pump automatically displays the effective rate in mL/hr.

CUSTOM DILUTION: In this mode the pump is programmed for a continuous infusion and the drug concentration is adjusted for a target infusion rate and dose. The target rate is entered in mL/hr, the patient’s body weight is entered in kg, the initial drug concentration is entered in mg/mL, the target dose is entered in mcg/kg/min, and the final volume is entered in mL. The pump calculates and displays the volume of drug (in mL) to be added to the infusion base solution to produce a final concentration that achieves the target rate and target dose. The final concentration is displayed when the infusion is initiated.

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Timed Infusion Modes

SINGLE DOSE: In this mode, the pump is programmed to infuse a single dose over a specified period of time. The dose is entered in mL, and the time period is entered in hours and minutes.

MANUAL SCHEDULE: In this mode, the pump is programmed to infuse a dose over a specified period of time, and to repeat the dose at specified intervals. The dose is entered in mL, and the time period and interval are entered in hours and minutes.

The pump alerts the operator when a dose is due to start. The operator must then press **START** to initiate each dose.

AUTO SCHEDULE: In this mode, the pump is programmed to infuse a dose over a specified period of time, and to repeat the infusion at specified intervals. The dose is entered in mL, and the time period and interval are entered in hours and minutes.

Whereas ***MANUAL SCHEDULE*** mode requires the operator to press **START** to initiate each dose, ***AUTO SCHEDULE*** mode automatically starts each dose when it is due.

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Syringe Data Tables

This table shows the performance ranges for infusion delivery parameters, which are a function of the syringe dimensions.

Infusion Rate Ranges

Syringe Manufacturer	Syringe Size (mL)	Minimum Flow Rate (mL/hr)	Maximum Flow Rate (mL/hr)	Minimum Flow Rate (mL/min)	Maximum Flow Rate (mL/min)
B-D Plastic	1	0.01	11	0.001	0.183
	3	0.02	38	0.001	0.633
	5	0.03	74	0.001	1.233
	10	0.1	107	0.002	1.783
	20	0.1	188	0.002	3.13
	30	0.1	241	0.002	4.01
	60	0.1	366	0.002	6.1
Monoject	1	0.01	11	0.001	0.183
	3	0.02	41	0.001	0.683
	6	0.03	83	0.001	1.383
	12	0.1	126	0.002	2.1
	20	0.1	208	0.002	3.46
	35	0.1	285	0.002	4.75
	60	0.1	366	0.002	6.1
Terumo	1	0.01	11	0.001	0.183
	3	0.02	41	0.001	0.683
	5	0.03	87	0.001	1.45
	10	0.1	129	0.002	2.15
	20	0.1	210	0.002	3.5
	30	0.1	276	0.002	4.6
	60	0.2	438	0.004	7.3

Maximum Flow Rates shown apply to pumps configured for:
Rate Range = H (High).

Rate Range = High limits maximum rate to maximum rate for syringe used.

Rate Range = Medium limits maximum rate to 120 mL/hr (2 mL/min).

Rate Range = Low limits maximum rate to 15 mL/hr (0.25 mL/min).

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Deliverable Volumes

This table shows the minimum and maximum programmable settings for all syringes that can be used with the pump. The limits shown apply to bolus, volume limit, single dose, and scheduled dose deliveries.

Syringe Manufacturer	Syringe Size (mL)	Minimum Volume (mL)	Maximum Volume (mL)
B-D Plastic	1 3 5 10 20 30 60	0.03 0.08 0.1 0.1 0.1 0.1 0.1	1 3 5 10 20 30 60
Monoject	1 3 6 12 20 35 60	0.03 0.08 0.1 0.1 0.1 0.1 0.1	1 3 6 12 20 35 60
Terumo	1 3 5 10 20 30 60	0.03 0.08 0.1 0.1 0.1 0.1 0.1	1 3 5 10 20 30 60

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Detailed Instructions

This section provides detailed descriptions of the seven basic steps required to operate the pump:

Note: Steps 1 and 2 can be performed after programming the pump if necessary (for example, if using CUSTOM DILUTION mode).

1. Attach a Baxter 2N series (or equivalent) extension set to the syringe and manually purge the air from the filled syringe and tubing.
2. Mount the syringe on the pump.
3. Slide the **ON/OFF** switch (7) to the “on” position (refer to figure on the following page).
4. Program the pump.
5. Purge the syringe and tubing again to remove slack from the plunger driver.
6. Connect the extension set to the patient.
7. Press **START** to begin the infusion.

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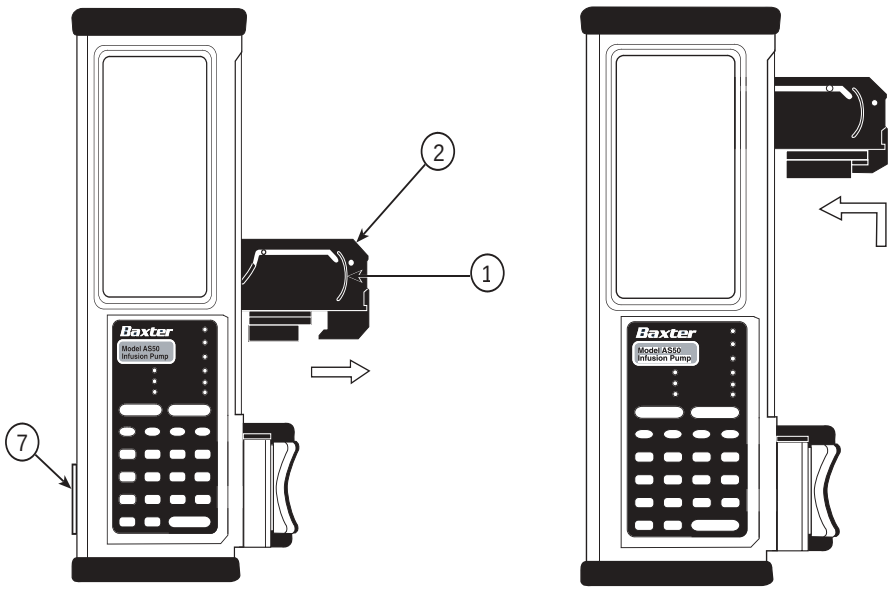
Preliminary Operations

Manual Purge

1. Attach a Baxter 2N Series or equivalent IV extension set to the filled syringe.
2. Remove the sterile cap from the end of the tubing.
3. Manually purge until a drop of fluid is visible at the end of the tubing.
4. Replace the sterile cap on the end of the tubing.

Mount the Syringe

1. Grasp the FINGER GRIP (1) on the PLUNGER DRIVER (2) and pull it all the way out.
2. Slide the PLUNGER DRIVER to the top of the pump and release the FINGER GRIP.



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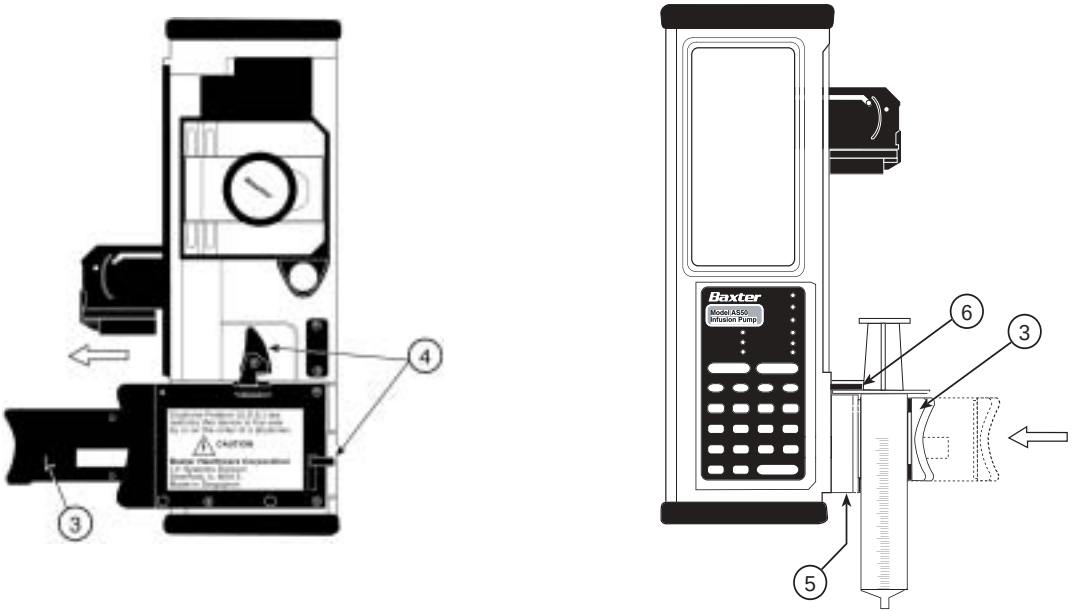
3. Open the BARREL CLAMP (3) by moving either of the BARREL CLAMP RELEASE LEVERS (4). Allow the barrel clamp to slide all the way open.

4. Place the syringe in the CRADLE (5). Be sure the syringe is centered in the V of the cradle, and that the flange of the syringe fits into the FLANGE SLOT (6).

5. Push the BARREL CLAMP (3) in firmly so that it securely grips the syringe barrel. The barrel clamp is shaped to fit the heel of the hand, making it easy to firmly clamp the syringe.



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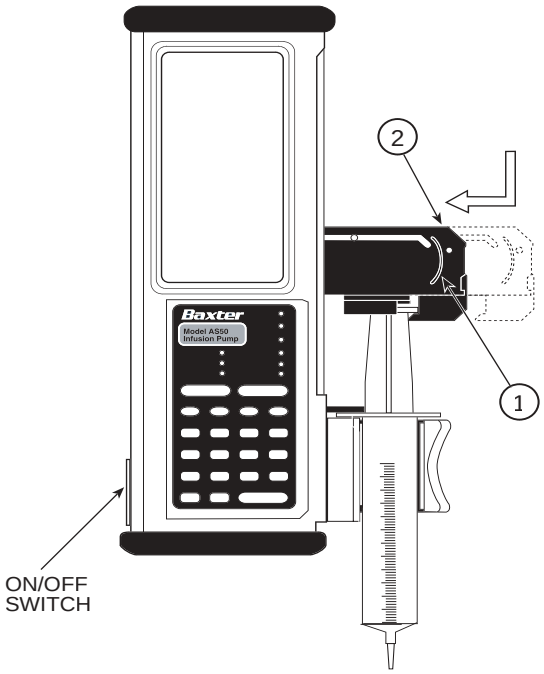
6. Grasp the FINGER GRIP (1) on the DRIVER (2) and pull it all the way out. Slide the DRIVER down until it contacts the syringe plunger, then release.

7. Push the PLUNGER CLAMP in firmly to capture the syringe plunger.



Turn the Pump On and Off

The **ON/OFF** switch is on the left side of the pump, near the bottom. Turn the pump on by sliding the switch up to the **ON** position.

Note: If the syringe is improperly mounted, the pump displays one of the following alert messages: ***CHECK BARREL***, ***CHECK FLANGE***, or ***CHECK PLUNGER***. Examine the syringe and correct the indicated problem. If a combination of conditions is sensed, the pump displays a ***CHECK SYRINGE*** alert or alarm message instead.

The pump is turned off by sliding the switch down to the **OFF** position.

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Check the Lamp Test

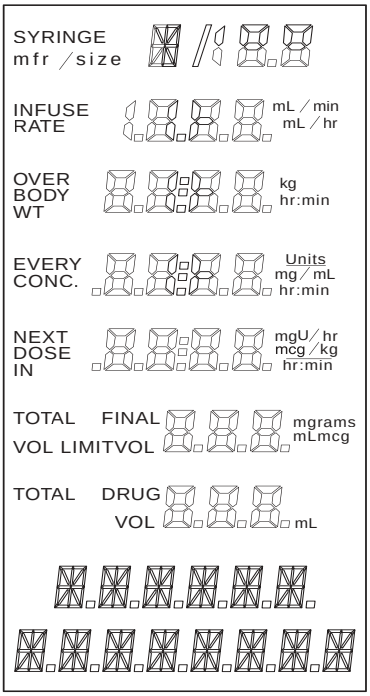
As soon as the pump is turned on, an automatic self-test begins. This includes the Lamp Test, which tests the status display and the status panel lights. Verify that all the lights illuminate and that all parts of the status display are legible. Carefully check the Lamp Test daily, or once per shift. See “Display, Battery, and Syringe Sensor Check” on page 75.

To examine the status display more closely during the Lamp Test, press and hold **STOP** while the status display characters are all visible. The Lamp Test will complete when **STOP** is released.

If **CONFIRM** is pressed during the Lamp Test, the battery voltage will be displayed in the text field immediately following completion of the Lamp Test.

The Lamp Test ends with a short beep. If the pump is configured to show an identifier message, it will appear in the text field at the bottom of the status display.

This completes the preliminary operations.



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Programming

The pump is ready for programming when the preliminary operations have been completed. The initial programming prompt is determined as follows:

- If the Protocol Library feature is enabled, a protocol selection prompt is displayed. Continue with the “Using Protocols” section below.
- If the Protocol Library feature is not enabled, a mode selection prompt is displayed. Skip to the appropriate mode programming section below.

For additional information about programming the pump, see “General Programming Information” on page 48.

Using Protocols

If the Protocol Library feature is enabled, the pump display alternates the prompts ▲▼ ***SELECT LIBRARY*** and ▲▼ ***SELECT PROTOCOL***.

Selecting a Protocol Library

If ▲▼***SELECT LIBRARY*** is displayed, use the ▲ and ▼ keys as necessary to display the name of the desired protocol library and press **CONFIRM** to complete the selection.

Note: If the ***NONE*** selection is available, the Protocol Library feature may be bypassed by selecting ***NONE***. Continue with the appropriate mode programming section below.

Selecting a Protocol

If ▼▲ ***SELECT PROTOCOL*** is displayed, use the ▲ and ▼ keys as necessary to display the name of the desired protocol, and press **CONFIRM** to complete the selection.

Note: The protocol name is continuously displayed in the text field except when a message or prompt must be displayed.

If the ***NONE*** selection is available, the Protocol Library feature may be bypassed by selecting ***NONE***. Continue with the appropriate mode programming section below.

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Selecting an Infusion Mode

If a default mode has been assigned to the selected protocol, the pump sets the infusion mode automatically. The name of the mode is displayed briefly in the text field, and programming continues with syringe manufacturer selection.

If no default mode has been assigned to the selected protocol, the pump displays a ***SELECT MODE*** ▼▲ prompt.

Continue with the appropriate mode programming section below.

For additional information about the Protocol Library, see “Protocol Library Feature” on page 21.

Programming mL/hr and mL/min Mode

In these modes, the pump runs at a programmed, constant rate. A volume limit can also be programmed in these modes.

Note: If a protocol has been selected, the infusion mode may appear automatically.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.
2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.

Note: If a protocol has been selected, a default infusion rate may appear automatically. Use ▲ and ▼ or the digit keys to modify this value as necessary.

3. Enter the infusion rate in mL/hr or mL/min, depending on the infusion mode selected.
4. Press **CONFIRM** to complete the entry.

Volume Limit

The Volume Limit feature is a configurable option available only in the mL/hr and mL/min modes. The pump stops when the programmed volume limit has been delivered.

Enter the desired volume limit. When the delivery begins, the VOL LIMIT field displays the amount of drug remaining until the programmed volume limit is reached. The pump stops when the VOL LIMIT field reaches zero.

The Volume Limit feature can be temporarily disabled without reconfiguring the pump by programming zero (**0**) in the VOL LIMIT field.

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Bolus in mL/hr and mL/min Modes

Note: If a protocol has been selected, bolus delivery may be disallowed or a default bolus size may appear automatically. If a default bolus size is displayed, use ▲ and ▼ or the digit keys to modify the value as necessary.

If the infusion program is to include a bolus delivery:

1. Press **BOLUS** to obtain the bolus programming display.
2. Press **EDIT**, then use the digit keys to set the bolus size (in mL).
3. Press **CONFIRM** to store the bolus size and return to the normal display. The bolus infusion rate is automatically set.

See “Bolus Function” on page 55 for more information on bolus delivery.

Note: For mL/min mode, the bolus rate is displayed in mL/min. For all other modes, it is displayed in mL/hr.

mL/hr and mL/min Programming Notes

1. See “Syringe Data Tables” on page 25 for minimum and maximum infusion rates for each syringe.
2. Pressing **CONFIRM** during delivery briefly displays additional program data.
3. A bolus can only be programmed, edited, or delivered after the syringe size has been programmed.

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Programming Units/hr, Units/min, mUnits/hr, and mUnits/min Modes

In these modes, the pump runs at a programmed, constant rate. The infusion is programmed in terms of drug concentration and dose.

Note: If a protocol has been selected, the infusion mode may have been selected automatically.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.
2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.

Note: If a protocol has been selected, a default drug concentration may appear automatically. If a default drug concentration is displayed, use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

3. At the ***ENTER CONCENTR*** prompt, enter the drug concentration (***CONC.***) in Units/mL. Press **CONFIRM** to complete the data entry.

Note: If a protocol has been selected, a default dose may appear automatically. Use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

4. At the ***ENTER DOSE*** prompt, enter the dose in Units/hr, Units/min, mUnits/hr, or mUnits/min (mUnits = milliUnits), depending on the infusion mode selected. Press **CONFIRM** to complete the data entry. The pump automatically calculates and displays the equivalent rate in mL/hr.

Bolus in Units/hr, Units/min, mUnits/hr, and mUnits/min Modes

Note: If a protocol has been selected, bolus delivery may be disallowed or a default bolus size may appear automatically. If a default bolus size is displayed, use ▲ and ▼ or the digit keys to modify the value as necessary.

In these modes, bolus size is entered in Units or mUnits. The pump automatically calculates the equivalent bolus size in mL and displays both values. Bolus rate is displayed in mL/hr. See “Bolus Function” on page 55 for more information on bolus delivery.

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Programming Notes

1. The drug concentration range is from 0.01 Units/mL to 9999 Units/mL. The dose limits are determined by the drug concentration and syringe selection. See “Syringe Data Tables” on page 25 for minimum and maximum infusion rates for each syringe.
2. The ***CONC***. field cannot be reprogrammed once the infusion has been started.
3. Pressing **CONFIRM** during delivery briefly displays additional program data.
4. A bolus can only be programmed, edited, or delivered after the drug concentration (***CONC***.) has been programmed.

Programming mg/hr, mg/min, mcg/hr, and mcg/min Modes

In these modes, the pump runs at a programmed, constant rate. The infusion is programmed in terms of drug concentration and dose.

Note: If a protocol has been selected, the infusion mode may have been selected automatically.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.
2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.

Note: If a protocol has been selected, a default drug concentration may appear automatically. If a default drug concentration is displayed, use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

3. Enter the drug concentration (***CONC***.) in mg/mL. Press **CONFIRM** to complete the data entry.

Note: If a protocol has been selected, a default dose may appear automatically. Use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

4. Enter the dose in mg/hr, mg/min, mcg/hr or mcg/min, depending on the infusion mode selected. Press **CONFIRM** to complete the data entry. The pump automatically calculates and displays the equivalent rate in mL/hr.

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Bolus in mg/hr, mg/min, mcg/hr, and mcg/min Modes

Note: If a protocol has been selected, bolus delivery may be disallowed or a default bolus size may appear automatically. If a default bolus size is displayed, use ▲ and ▼ or the digit keys to modify the value as necessary.

In these modes, bolus size is entered in mg or mcg. The pump automatically calculates the equivalent bolus size in mL and displays both values. Bolus rate is displayed in mL/hr. See “Bolus Function” on page 55 for more information on bolus delivery.

Programming Notes

1. The drug concentration range is from 0.0001 mg/mL to 100.0 mg/mL. The dose limits are determined by the drug concentration and syringe selection. See “Syringe Data Tables” on page 25 for minimum and maximum infusion rates for each syringe.
2. The ***CONC***. field cannot be reprogrammed once the infusion has been started.
3. Pressing **CONFIRM** during delivery briefly displays additional program data.
4. A bolus can only be programmed, edited, or delivered after the drug concentration (***CONC***.) has been programmed.

Programming mg/kg/hr, mg/kg/min, mcg/kg/hr, and mcg/kg/min Modes

In these modes, the pump runs at a programmed, constant rate. The infusion is programmed in terms of patient body weight, drug concentration and dose.

Note: If a protocol has been selected, the infusion mode may have been selected automatically.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.
2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.
3. Enter the patient body weight (***BODY WT***) in kg. Press **CONFIRM** to complete the data entry.

Note: If a protocol has been selected, a default drug concentration may appear automatically. If a default drug concentration is displayed, use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

4. Enter the drug concentration (***CONC***.) in mg/mL. Press **CONFIRM** to complete the data entry.

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Note: If a protocol has been selected, a default dose may appear automatically. Use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

5. Enter the dose in mg/kg/hr, mg/kg/min, mcg/kg/hr or mcg/kg/min, depending on the infusion mode selected. Press **CONFIRM** to complete the data entry. The pump automatically calculates and displays the equivalent rate in mL/hr.

Bolus in mg/kg/hr, mg/kg/min, mcg/kg/hr, and mcg/kg/min Modes

Note: If a protocol has been selected, bolus delivery may be disallowed or a default bolus size may appear automatically. If a default bolus size is displayed, use ▲ and ▼ or the digit keys to modify the value as necessary.

In mg/kg/hr and mg/kg/min modes, bolus size is entered in mg/kg. In mcg/kg/hr and mcg/kg/min, the bolus size is entered in mcg/kg. The pump automatically calculates the equivalent bolus size in mL and displays both values. The bolus rate is displayed in mL/hr. See “Bolus Function” on page 55 for more information on bolus delivery.

Programming Notes

1. The patient body weight range is from 0.01 to 200.0 kilograms (kg). The drug concentration range is from 0.0001 mg/mL to 100.0 mg/mL. The concentration range may be further limited for very large or small body weights. The dose limits are determined by the drug concentration and syringe selection. See “Syringe Data Tables” on page 25 for minimum and maximum infusion rates for each syringe.

2. The ***CONC***. and ***BODY WT*** fields cannot be reprogrammed once the infusion has been started.

3. Pressing **CONFIRM** during delivery briefly displays additional program data.

4. A bolus can only be programmed, edited, or delivered after the drug concentration (***CONC***.) has been programmed.

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Programming CUSTOM DILUTION Mode

In this mode, the pump runs at a programmed, constant rate. The infusion is programmed in terms of target rate, patient body weight, initial drug concentration, target dose, and final volume. The pump calculates and displays the drug volume to be mixed with sufficient IV base fluid to yield the programmed final volume. The final concentration is displayed when a bolus or infusion is initiated.

Note: The rate, body weight, concentration, and dose fields will not be editable after the confirm key is pressed. Power the pump off and then back on to make these fields editable again.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the CUSTOM DILUTION mode.
2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.
3. Enter the target rate (***RATE***) in mL/hr. Press **CONFIRM** to complete the data entry.
4. Enter the patient body weight (***BODY WT***) in kg. Press **CONFIRM** to complete the data entry.
5. Enter the initial drug concentration (***CONC***.) in mg/mL. Press **CONFIRM** to complete the data entry.
6. Enter the target dose (***DOSE***) in mcg/kg/min. Press **CONFIRM** to complete the data entry.
7. Enter the final volume (***FINAL VOL***) in mL. Press **CONFIRM** to complete the data entry.
8. In the ***DRUG VOL*** field, the pump displays the volume of drug that must be mixed with IV base fluid to yield the programmed final volume. The text field displays ***DRUG VOL***. Press **CONFIRM** to acknowledge the drug volume.
9. Mix the indicated drug volume (***DRUG VOL***) with sufficient IV base fluid to produce the final volume that was programmed (***FINAL VOL***).

Note: The solution may be mixed directly in the syringe, or may be mixed in an IV bag and then drawn up into the syringe.

10. Attach a 2N Series (or equivalent) IV extension set to the syringe and manually purge the air from the filled syringe and tubing.
11. Mount the syringe.
12. Perform a purge operation to remove slack from the plunger driver.
13. After completing the purge procedures, press **START**. The new final concentration will be displayed in the concentration field.

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Bolus in CUSTOM DILUTION Mode

In this mode, bolus size is programmed in mcg/kg. The pump automatically calculates the equivalent bolus size in mL and displays both values. Bolus rate is displayed in mL/hr. See “Bolus Function” on page 55 for more information on bolus delivery.

Programming Notes

IMPORTANT: If the *FINAL VOL* field is altered after the solution has been mixed, the solution must be re-mixed using the new *DRUG VOL* quantity.

For maximum accuracy in measuring the drug volume, select the smallest syringe that will contain the entire ***DRUG VOL*** quantity.

When **CONFIRM** is pressed to confirm the ***DRUG VOL*** value, the target rate field (***RATE***) is updated to show the actual infusion rate that will be used. (Usually the actual rate is very close to or the same as the programmed target rate.)

The program data fields all remain displayed and available for editing until an infusion or bolus is started. At that point, the pump replaces the original drug concentration (***CONC***.) with the final drug concentration, and clears the fields containing the final volume (***FINAL VOL***) and the drug volume (***DRUG VOL***). The rate of infusion, patient body weight and dose remain displayed. Pressing **CONFIRM** temporarily displays the hidden program data (original drug concentration, final volume, and drug volume).

Target rate (***RATE***) limits are determined by the syringe selection and Rate Range configuration (see “Syringe Data Tables” on page 25 for minimum and maximum infusion rates for each syringe). The patient body weight range is from 0.01 to 200.0 kilograms (kg). The drug concentration range is from 0.0001 mg/mL to 100.0 mg/mL. The concentration range may be further limited for very large or small body weights. Target dose limits are determined by the drug concentration and syringe selection. Final Volume range is from 30 mL to 250 mL.

The ***CONC***. and ***BODY WT*** fields cannot be reprogrammed once the infusion has been started.

A bolus can only be programmed, edited, or delivered after the pump has been fully programmed.

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Programming SINGLE DOSE Mode

SINGLE DOSE mode delivers a programmed volume of drug over a specified period of time. The infusion is programmed in terms of dose volume and dose duration.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.
2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.
3. Enter the dose volume (***INFUSE***) in mL. Press **CONFIRM** to complete the data entry.
4. Enter the dose duration (***OVER***) in hours and minutes. Press **CONFIRM** to complete the data entry.

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SINGLE DOSE Mode Programming Notes

1. All time displays use standard time notation: the two digits to the left of the colon show hours, the two digits to the right show minutes.

2. If either the ***INFUSE*** field or the ***OVER*** field is edited, the pump treats the result as a new infusion. As a reminder, ***DOSE CANCELED*** appears for a few seconds.

> **Example**: Program the pump to infuse 5 mL over 5 minutes, using a B-D 30 mL syringe.
>
> Stop the infusion when the ***TOTAL ML*** field shows that about 2 mL have been delivered.
>
> Now edit the ***OVER*** field to 6 minutes (note that ***DOSE CANCELED*** appears for a few seconds), and start the infusion.
>
> When the pump stops after 6 minutes, about 7 mL will have been delivered; 2 mL from the original infusion, and 5 mL from the edited infusion.

3. The pump issues a ***DOSE COMPLETE*** alarm at the end of the infusion if the Dose Complete Alarm option is enabled.

4. Bolus operation is not available in this delivery mode.

5. Pressing **CONFIRM** during delivery briefly displays additional programming data.

Programming MANUAL SCHEDULE Mode

MANUAL SCHEDULE mode is a timed infusion mode for use when a programmed dose is to be repeated at regular intervals. The infusion is programmed in terms of dose volume and dose duration, and the time from the start of one dose to the start of the next. Each dose delivery must be manually initiated.

MANUAL SCHEDULE mode also allows a delay to the start of the first dose, allowing a time delay before the infusion regimen begins.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.

2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.

3. Enter the dose volume (***INFUSE***) in mL. Press **CONFIRM** to complete the data entry.

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4. Enter the dose duration (***OVER***) in hours and minutes. Press **CONFIRM** to complete the data entry.

5. Enter the interval (***EVERY***) in hours and minutes. This is the time from the start of one dose to the start of the next dose. Press **CONFIRM** to complete the data entry.

6. Enter the delay (***NEXT DOSE IN***), then press **CONFIRM**. This is the time interval from when **START** is pressed until the first dose becomes due. Enter **0:00** to begin infusing the first dose immediately.

Dose Due

Note: **START** must be pressed to begin infusing each dose.

The ***NEXT DOSE IN*** field shows the time remaining until the next dose is due to be delivered. When this time counts down to 0:00, the pump signals that the dose is due by flashing the **ALERT** and **STANDBY** lights, sounding continuous beeps, and showing ***DOSE DUE*** in the text field. **START** must be pressed to begin infusing each dose.

When a dose is due, pressing any key other than **START** silences the audio, turns off the ***DOSE DUE*** prompt and **ALERT** light, and leaves the pump in Standby state, but does not begin dose delivery.

“Counting Time” Display

The three **RUN** lights flash in a “falling drop” pattern while the pump is infusing. When the pump is counting time between scheduled doses, only the top **RUN** light flashes.

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Programming Notes

Precaution: In MANUAL SCHEDULE mode, START must be pressed to deliver each dose and continue the infusion regimen. Pressing any other key silences the audio portion of the DOSE DUE alarm and leaves the pump in Standby state, without initiating a dose delivery.

1. For MANUAL SCHEDULE mode it is recommended that the Idle Alarm feature be enabled (configured), and that the Auto Lock feature be disabled (not configured).

2. All time displays use standard time notation: the two digits to the left of the colon show hours, the two digits to the right show minutes.

3. The programmed delivery can be stopped at any time by pressing **STOP**. The **RUN** light(s) then turn off, the **STANDBY** light begins flashing, and the ***TOTAL ML*** field stops counting up. Press **START** to continue the infusion program.

Note: Pressing **STOP** affects the ***NEXT DOSE IN*** time field in two different ways, depending on the pump's infusion status at the time:

- If **STOP** is pressed while the pump is infusing a dose (the three **RUN** lights are flashing in sequence), the ***NEXT DOSE IN*** field will stop counting down, until **START** is pressed again. This feature allows the schedule to be delayed while ensuring delivery of the full dose.

- If **STOP** is pressed while the pump is counting down the time to the next dose (only the top **RUN** light is flashing), the ***NEXT DOSE IN*** field will continue to count down while the pump is stopped. This feature allows editing during idle time, without altering the overall schedule. If a dose becomes due while the pump is stopped, the ***DOSE DUE*** alarm will be suppressed and delivery of the dose will begin immediately when **START** is pressed.

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4. If either the ***INFUSE*** field or the ***OVER*** field is edited, the pump treats the result as a new infusion. As a reminder, ***DOSE CANCELED*** appears for a few seconds.

> **Example**: Program the pump to infuse 5 mL over 5 minutes, using a B-D 30 mL syringe.
>
> Stop the infusion when the ***TOTAL ML*** field shows that about 2 mL have been delivered.
>
> Now edit the ***OVER*** field to 6 minutes (note that ***DOSE CANCELED*** appears for a few seconds), and start the infusion.
>
> When the pump stops after 6 minutes, about 7 mL will have been delivered; 2 mL from the original infusion, and 5 mL from the edited infusion.

5. Pressing **CONFIRM** during delivery briefly displays additional program data.

6. Bolus operation is not available in this delivery mode.

Programming AUTO SCHEDULE Mode

AUTO SCHEDULE mode is a timed infusion mode for use when a programmed dose is to be repeated at regular intervals. The infusion is programmed in terms of dose volume and dose duration, and the time from the start of one dose to the start of the next. Each dose delivery is automatically initiated.

AUTO SCHEDULE mode also adds a delay to the start of the first dose, allowing a time delay before the infusion regimen begins.

1. At the ***SELECT MODE*** ▲▼ prompt, use ▲ or ▼ to display the available infusion mode selections. Press **CONFIRM** to select the desired infusion mode.

2. Use ▲ or ▼ and **CONFIRM** as required to select the syringe manufacturer and size.

3. Enter the dose volume (***INFUSE***) in mL. Press **CONFIRM** to complete the data entry.

4. Enter the dose duration (***OVER***) in hours and minutes. Press **CONFIRM** to complete the data entry.

5. Enter the interval (***EVERY***) in hours and minutes. This is the time from the start of one dose to the start of the next dose. Press **CONFIRM** to complete the data entry.

6. Enter the delay (***NEXT DOSE IN***), then press **CONFIRM**. This is the time interval from when **START** is pressed until the first dose becomes due. Enter **0:00** to begin infusing the first dose immediately.

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Dose Initiation

The ***NEXT DOSE IN*** field on the display shows the time remaining until the next dose is due to be delivered. When this time counts down to 0:00, the pump automatically begins infusing the dose.

"Counting Time" Display

The three **RUN** lights flash in a "falling drop" pattern while the pump is infusing. When the pump is counting time between scheduled doses, only the top **RUN** light flashes.

Programming Notes

1. All time displays use standard time notation: the two digits to the left of the colon show hours, the two digits to the right show minutes.

2. The programmed delivery can be stopped at any time by pressing **STOP**. The **RUN** light(s) then turn off, the **STANDBY** light begins flashing, and the ***TOTAL ML*** field stops counting up. Press **START** to continue the infusion program.

3. Pressing **STOP** affects the ***NEXT DOSE IN*** time field in two different ways, depending on the pump's infusion status at the time:

   - If **STOP** is pressed while the pump is infusing a dose (the three **RUN** lights are flashing in sequence), the ***NEXT DOSE IN*** field will stop counting down, until **START** is pressed again. This feature allows the schedule to be delayed while ensuring delivery of the full dose.

   - If **STOP** is pressed while the pump is counting down the time to the next dose (only the top **RUN** light is flashing), the ***NEXT DOSE IN*** field will continue to count down while the pump is stopped. This feature allows editing during idle time, without altering the overall schedule. If a dose becomes due while the pump is stopped, delivery of the dose will begin immediately when **START** is pressed.

4. If either the **INFUSE** field or the ***OVER*** field is edited, the pump treats the result as a new infusion. As a reminder, ***DOSE CANCELED*** appears for a few seconds.

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Example: Program the pump to infuse 5 mL over 5 minutes, using a B-D 30 mL syringe.

Stop the infusion when the ***TOTAL ML*** field shows that about 2 mL have been delivered.

Now edit the ***OVER*** field to 6 minutes (note that ***DOSE CANCELED*** appears for a few seconds), and start the infusion.

When the pump stops after 6 minutes, about 7 mL will have been delivered; 2 mL from the original infusion, and 5 mL from the edited infusion.

Note: Pressing **CONFIRM** during delivery briefly displays additional program data.
Bolus operation is not available in this delivery mode.

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General Programming Information

Data Entry

The digit keys are used to enter program data.

Before pressing **CONFIRM** to complete a program data entry, the value can be changed by pressing ▲ or ▼ or can be replaced by pressing **CLR** and entering a new value. A value that appears automatically (as a result of selecting a protocol) can be changed by pressing ▲ or ▼ or can be replaced by entering a new value without pressing **CLR**.

Field Selection

The currently selected field on the pump's status display flashes. Use ▲ and ▼ to select the next field. Press **EDIT** to open the currently selected field for editing. When a field is opened for editing, the annunciators stop flashing and the value itself begins flashing.

Editing in Standby State

All modes except CUSTOM DILUTION modes:

Almost all program data can be changed (edited). The exceptions are:

- Once a protocol library, protocol or infusion mode has been selected, the only way to select a different protocol library, protocol or infusion mode is to turn the pump off, then turn it back on and reprogram.
- The drug concentration (***CONC***.) and patient body weight (***BODY WT***) fields cannot be changed (edited) once an infusion or bolus has been started.

To edit a programmed field:

1. Use ▲ and ▼ to select the field to be changed.
2. Press **EDIT**. Use ▲, ▼, and the digit keys as necessary to enter the new value. Press **CONFIRM** to complete the change.

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CUSTOM DILUTION mode:

To make a change to syringe manufacturer, syringe size, target rate, body weight or initial concentration before a value is entered for final volume:

1. Press **CONFIRM** while dashes are displayed in the ***FINAL VOL*** field.
2. Use ▲ and ▼ to select the field to be changed.
3. Press **EDIT**. Use ▲, ▼, and the digit keys as necessary to enter the new value. Press **CONFIRM** to complete the change.
4. Use ▲ and ▼ to return to the ***FINAL VOL*** field.
5. Press **EDIT**. Use ▲, ▼, and the digit keys as necessary to enter the final volume. Press **CONFIRM** to complete the entry.
6. Finish programming.

Only the final volume field will be editable after the confirm key has been pressed and the pump starts running or delivers a bolus. To make a change to the final volume field:

7. Press **EDIT**. Use ▲, ▼, and the digit keys as necessary to enter the new value. Press **CONFIRM** to complete the change.

The final concentration is displayed when a bolus or infusion is initiated.

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Programming Notes

If the *FINAL VOL* field is altered after the solution has been mixed, the solution must be re-mixed using the new *DRUG VOL* quantity.

1. For maximum accuracy in measuring the drug volume, select the smallest syringe that will contain the entire ***DRUG VOL*** quantity.
2. The ***DRUG VOL*** field may not be edited at any time, once it has been programmed.
3. Refer to “Programming Notes” on page 40.

Editing in Run State

The fields that can be edited while the pump is in Run state are listed below:

Mode	Fields
mL/hr, mL/min	***RATE, TOTAL ML***
SINGLE DOSE, MANUAL/AUTO SCHEDULE	***TOTAL ML***
CUSTOM DILUTION	***DOSE, TOTAL ML***
All other modes	***RATE, DOSE, TOTAL ML***

The ***TOTAL ML*** field can be cleared while the infusion is running. (The ***TOTAL ML*** field is a data display, and cannot be edited.)

Edit Cancellation

If a field has been opened for editing, pressing **EDIT** again restores the previous value and cancels the edit operation. The pump displays ***EDIT CANCELED*** for a few seconds.

Example: Select mL/hr mode, and program a B-D 60 mL syringe.

Enter **99** in the ***RATE*** field and a volume limit of 60 mL.

The ***RATE*** field annunciators flash to show it is the current field.

Pressing **CLR** at this point only results in an “invalid key” error beep.

Press **EDIT**. Enter another valid number.

Press **EDIT** again. This will undo the change, restore the previous value (**99**), and display ***EDIT CANCELED***.

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Number Out of Range

Every programmable field is limited to a particular range of allowed program values, depending on the syringe, drug concentration, and other factors. Attempting to program a value outside the acceptable range results in a ***PUMP LIMIT*** alert. The pump beeps and substitutes the nearest acceptable value. Press **CONFIRM** to accept the value, or program a new value.

Data Test

Whenever a data field is edited, the pump tests the remaining program data fields for range limits. If there is a conflict, the affected fields are cleared to dashes, and the first cleared field is automatically opened for editing. As each cleared field is reprogrammed, the next cleared field (if any) is automatically opened. All cleared fields must be reprogrammed before the infusion can be started.

Example: Reprogramming the ***SYRINGE MFR*** field automatically clears the ***SYRINGE SIZE*** field.

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Additional Functions and Operations

Purge Function

The Purge function advances the syringe plunger driver a preset distance. Manually purge the syringe and IV extension set *before* mounting the syringe in the pump. Perform the Purge function *after* the syringe is mounted on the pump, (before connecting to the patient) to eliminate slack in the drive mechanism and thus ensure prompt fluid delivery when the infusion starts.

Precaution: To prevent unintended delivery to the patient, the IV extension set must be disconnected from the patient while purging.

The “Purge Delivery Table” on page 54 lists the nominal amount of fluid delivered in one complete Purge cycle, if there were no slack in the drive mechanism. Use this information for calculating the excess fluid allowance when filling the syringe.

Purge operation is allowed only when the pump is in Standby state.

Purge Procedure

Precaution: To prevent unintended delivery to the patient, the IV extension set must be disconnected from the patient while purging.

1. After programming the pump, press **STOP** (if necessary), to put the pump in Standby.
2. Press **PURGE**. The normal display is temporarily replaced by a display showing the purge rate in mL/hr, and the message ***PURGE READY***.

Note: If **START** is not pressed within 10 seconds, the purge function is canceled and the pump reverts to Standby state.

If a steady drip of fluid is observed before the full purge volume is delivered, purging can be stopped immediately by pressing **STOP**.

3. Press **START** to begin delivering the fixed purge volume.

   The accumulating purge volume is displayed while purging is in progress, then the normal Standby state display resumes, and the text field reads ***PURGE COMPLETE*** for a few seconds. The purge may be repeated until the required volume is achieved. The

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purge accumulated volume will disappear when the **START** key is pressed and will not be included in the total volume.

4. Repeat steps 2 and 3 as often as necessary to obtain a steady drip at the end of the tubing.

Purge Delivery Table

Syringe Manufacturer	Syringe Size (mL)	Approximate Purge Volume (mL)	Purge Rate (mL/hr)	Purge Rate (mL/min)
B-D Plastic	1	0.02	11	0.19
	3	0.08	38	0.63
	5	0.15	74	1.2
	10	0.22	107	1.7
	20	0.39	188	3.1
	30	0.50	241	4.0
	60	0.75	366	6.1
Monoject	1	0.02	11	0.19
	3	0.09	41	0.68
	6	0.17	83	1.3
	12	0.26	126	2.1
	20	0.43	208	3.4
	35	0.59	285	4.7
	60	0.75	366	6.1
Terumo	1	0.02	11	0.19
	3	0.09	41	0.69
	5	0.18	87	1.4
	10	0.27	129	2.1
	20	0.44	210	3.5
	30	0.58	276	4.6
	60	0.75	438	7.3

NOTE: Purge volume and rate information shown applies to pumps configured for Rate Range = H (High).

NOTE: Purge volumes are approximately the amount delivered in a single complete purge delivery, without slack in the drive system.

NOTE: The volume of purged fluid is not added to the amount in the ***TOTAL mL*** field.

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Bolus Function

Note: If a protocol is selected, the bolus function may not be allowed. If the protocol disallows the bolus function, the pump beeps and displays the message ***NOT ALLOWED*** when **BOLUS** is pressed.

A bolus is a fixed dose which may be programmed and delivered, either during an infusion or while the pump is in Standby state. The pump allows the operator to program the rate of infusion for a bolus, and to program the bolus size either in terms of dose or volume where applicable.

Bolus Units

Infusion Mode	Bolus Size Units
mL/hr, mL/min	mL (milliliters)
Units/hr, Units/min mUnits/hr, mUnits/min	Units
mg/hr, mg/min mcg/hr, mcg/min	mg (milligrams)
mg/kg/hr, mg/kg/min, CUSTOM DILUTION	mg/kg (milligrams of drug per kilogram of patient body weight)
mcg/kg/hr, mcg/kg/min	mcg/kg (micrograms of drug per kilogram of patient body weight)
SINGLE DOSE, MANUAL SCHEDULE, AUTO SCHEDULE	Bolus not allowed.

Bolus Size Limits

The minimum programmable bolus size is approximately the same as the minimum deliverable volume (see “Syringe Data Tables” on page 25).

The maximum programmable bolus size is the lesser of:

- The syringe size (the entire syringe may be programmed as a single bolus).
- 9999 Units, 9999 mg, 9999 mg/kg or 9999 mcg/kg (depending on the selected mode).

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Bolus Rate

The bolus infusion rate is the smallest of:

- The maximum infusion rate for the syringe (see “Syringe Data Tables” on page 25).
- The maximum rate established by the ***RATE RANGE*** configuration option.
- The bolus maximum rate specified by the selected protocol (if applicable).

Example 1: If a pump is configured for Rate Range = Medium, the overall maximum infusion rate is 120 mL/hr.

However, the maximum infusion rate for a B-D 10 mL syringe is 107 mL/hr. Therefore, if a B-D 10 mL syringe is used, the bolus rate will be the lesser of the two limits, or 107 mL/hr.

Example 2: Assume that the same pump and syringe from Example 1 are used.

A protocol is selected that specifies a bolus maximum rate of 120 mcg/kg/hr.

If a patient body weight of 50 kg is programmed and the concentration is 0.1 mg/mL, the bolus maximum rate of 100 mcg/kg/hr will translate to a rate of 60 mL/hr, and the bolus rate will be limited to 60 mL/hr.

Bolus Programming

A bolus may be programmed during an infusion without interrupting the normal delivery.

Note: If a protocol is selected, the bolus function may not be allowed. If the protocol disallows the bolus function, the pump beeps and displays the message ***NOT ALLOWED*** when **BOLUS** is pressed.

Note: If a protocol has been selected, a default bolus value may appear automatically. Use ▲ and ▼ or the digit keys to modify this value as necessary, and press **CONFIRM** to complete the data entry.

1. Press **BOLUS**. The status display changes to the Bolus display.
   - If there is no programmed bolus size, the pump displays ***PRESS EDIT TO SET BOLUS SIZE***. Proceed to step 2.
   - If a bolus size has been programmed, the pump displays ***BOLUS READY***. Press **START** within 10 seconds to begin bolus delivery, or proceed to step 2 to change the programmed bolus size, or press **CONFIRM** to save the bolus data and return to the normal display.

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2. Press **EDIT**, then use the ▲, ▼ or digit keys as necessary to program the bolus size. When a bolus is fully programmed, the pump displays ***BOLUS READY***.

3. Press **START** to begin bolus delivery immediately or press **CONFIRM** to save the bolus data and return to the normal display.

Bolus Programming Notes

For mL/min mode, the bolus rate is displayed in mL/min. For all other modes it is displayed in mL/hr.

Pressing **BOLUS** during the ***BOLUS READY*** or ***PRESS EDIT TO SET BOLUS SIZE*** display cancels bolus programming and restores the normal display immediately.

A bolus can be programmed and delivered from Standby state, even when the infusion has not been fully programmed. The minimum program data required for bolus operation are: Syringe manufacturer and size, body weight (if applicable), and drug concentration (if applicable). In addition, for CUSTOM DILUTION mode, all remaining fields must be programmed.

Bolus Delivery

During bolus delivery, the text display reads ***BOLUS RUNNING*** and all three RUN lights flash simultaneously.

1. To halt bolus delivery before the full bolus amount has been delivered, press **STOP**. The normal display and operating state resumes. The text field reads ***BOLUS STOPPED*** for a few seconds.

2. If the pump is allowed to deliver the full bolus amount, the normal display and operating state are automatically restored. The text field reads ***BOLUS COMPLETE*** for a few seconds. In addition, if the ***BOLUS COMPLETE*** alert is enabled, the pump sounds two beeps and flashes the ALERT light.

Bolus Delivery Notes

During bolus delivery, the display shows the amount of the bolus that has been infused.

If bolus delivery is started during an infusion, the infusion resumes automatically once the bolus delivery ends. If the bolus delivery is stopped prematurely by pressing **STOP**, the pump displays ***DOSE RESUMES*** for a few seconds.

The bolus volume is added to the ***TOTAL ML*** display after the bolus operation stops.

Bolus Review

Press **BOLUS** to review the Bolus display. The bolus information will be displayed for about 10 seconds, or the normal display can be restored immediately by pressing **BOLUS** or **CONFIRM**.

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Bolus Editing

The bolus size can be edited during bolus programming and after a bolus has been fully programmed. A bolus may be edited during an infusion without interrupting normal delivery.

1. Press **BOLUS** to display the ***PRESS EDIT TO EDIT BOLUS SIZE*** prompt.
2. Press **EDIT** to open the bolus size field.
3. Use ▲ and ▼ or the digit keys to modify the value as necessary, and press **CONFIRM** to complete the edit.

   The pump displays ***BOLUS READY***.
4. Press **START** to begin bolus delivery immediately or press **CONFIRM** to save the bolus data and return to the normal display.

Repeating a Bolus Delivery

To repeat a bolus delivery:

1. Press **BOLUS** to display the bolus size.
2. Review the bolus program data.
3. Press **START**.

Changing the Syringe

To continue an infusion when a syringe becomes empty or to flush a line, the syringe may be replaced when the pump is in the Standby state.

If the new syringe does not have the same barrel size as the currently programmed syringe:

1. The pump displays ***VERIFY (NAME)***, where “name” refers to the currently programmed syringe manufacturer.

   Use ▲ and ▼ as needed to select the correct syringe manufacturer and press **CONFIRM** to complete the entry.
2. The pump displays ***VERIFY (SIZE)*** where “size” is the new syringe size recognized by the pump.

   Press **CONFIRM** after verifying that the pump is displaying the correct syringe size.

Note: Changing syringe size may invalidate the contents of other fields (e.g. ***VOL LIMIT***). In such cases, the pump automatically clears the necessary field(s). The infusion cannot be continued until all cleared fields have been reprogrammed.

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- If the syringe is improperly mounted, the pump displays one of the following alert or alarm messages: ***CHECK BARREL***, ***CHECK FLANGE***, or ***CHECK PLUNGER***. Examine the syringe and correct the indicated problem.

  If a combination of such conditions is sensed, the pump displays a ***CHECK SYRINGE*** alert or alarm message instead.

Lock and Auto Lock Functions

The Lock function serves two purposes. First, it reduces risk of accidental key activations by disabling all keys except **LOCK**. Second, the Lock function makes it convenient to program the pump in advance of delivery by disabling the audio portion of the ***PUMP IS IDLE*** alert or alarm.

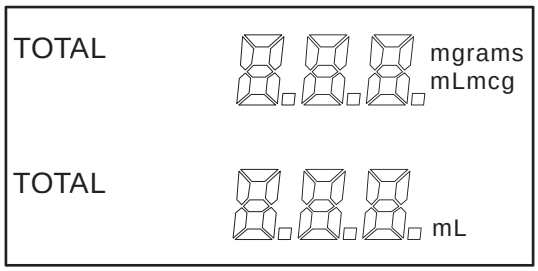
The Lock function is activated by pressing **LOCK**. Pressing **LOCK** again restores normal operation. The ***LOCK*** light remains on while the Lock function is active.

Note: The pump will not allow the Lock function to be active during a ***LINE OCCLUDED*** alarm condition.

The Auto Lock feature can be enabled through pump configuration. During an infusion, the Auto Lock feature automatically sets the Lock function two minutes after the last key is pressed. This feature is available only while the pump is in Run state.

If the pump enters Standby State because of an alarm condition, the keypad is automatically unlocked.

The Total Delivered Display



The Total Delivered display indicates the accumulated total volume (in mL) that has been delivered. Some infusion modes also show the total delivery in other units, such as mcg, mg, or grams.

The Total Delivered display cannot be programmed, but can be cleared (reset to zero). To clear the total delivered information, press ▲ or ▼ to move to the ***TOTAL mL*** field. The annunciators will flash, then press **EDIT** and **CLR** to clear the display. After resetting the Total Delivered display to zero, the previous value cannot be restored.

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Note: Purge volumes are not included in the total, because purged fluid is not intended to be infused into the patient.

Display totals are rounded up at the digit displayed at the far right.

Example: if a total delivered value is 0.005, the pump displays ***0.01***. If a total delivered value is 30.15, the pump displays ***30.2***.

If an accumulated total becomes too large to display (that is, over 999), the field changes to ***EEE***.

Expanded Data Display

The status display generally displays only the most important infusion information. Pressing **CONFIRM** when the pump is fully programmed causes the pump to temporarily display additional program, syringe, and battery voltage information. Press **CONFIRM** again to restore the normal display immediately. If no key is pressed, the normal display automatically resumes in a few seconds.

Backlight Feature

The status display backlight is lit whenever the charger is connected and the pump power is on.

Control of the backlight when the charger is not connected is determined by the ***SET BACKLITE*** configuration option group. When the charger is not connected and this option is enabled for use, the pump turns on the backlight for the preconfigured time period following a keypress.

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Configuration

The pump can be custom-configured to meet particular needs, or to simplify infusion programming. Instructions for setting configuration options are given in the Auto Syringe AS50 Infusion Pump Technical Manual.

Configuration Review

The Configuration Review feature allows the pump's configuration to be examined without risk of accidental alteration. This feature is activated by entering the code number **123** at the initial prompt (***SELECT MODE*** ▲▼ or ***SELECT PROTOCOL*** ▲▼). The error beeps that occur when **123** is entered are provided to discourage patient tampering and may be ignored.

Date and Time Display

After **123** is entered, the date and time are briefly displayed. The time is displayed in hours and minutes, separated by a decimal point (***HH.MM***).

Software and Configuration Version Display

Following the time and date display, the software and configuration version numbers are briefly displayed.

The first line of the text display indicates the pump software version. The second line is divided into two fields. The left field displays the factory configuration version, and the right field displays a four character checksum that uniquely identifies the current configuration (including protocols), as shown below.

Example: The display for software version 6.00, factory configuration version D1, and a current configuration checksum of 3AC5, would be shown on the display as follows:

software version → **V 7.0 0**
factory configuration → **D 1** **3 A C 5** ← configuration checksum

The checksum field allows a high-confidence rapid comparison of configurations between two pumps.

Reviewing Configuration Options

The configurable options are organized into several groups, each of which begins with a prompt that requires a "yes" or "no" response. Each option group is identified by name in the text display field (for example: ***VIEW MODES***). The syringe manufacturer field displays ***Y*** (for "yes"), which represents the pending response.

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To begin reviewing the options within the current group, press **CONFIRM** to accept the pending ***Y*** response. The text field will display only the options that are configured. Press **CONFIRM** to view each additional option. When the last option in a group has been displayed, the next option group prompt is displayed (for example: ***VIEW SYRINGES***).

To skip an option group, press either ▲ or ▼ to change the ***Y*** to ***N*** (for "no"). Press **CONFIRM** to advance to the next option group.

To review the Modes group, the initial prompt is ***VIEW MODES***. Answering ***Y*** (the default response) opens up that group for review. Answering ***N*** skips that group and prompts for the manufacturers group (***VIEW MFRS***).

The following table shows the configuration groups, and the options within each group.

Note: Inactive options are not shown in Configuration Review mode.

Configuration Review Table

GROUP PROMPT	GROUP SELECTIONS		
VIEW LIBRARY	List of enabled protocol libraries.		
VIEW MODES	ML/HR ML/MIN UNITS/HR UNITS/MIN MUNITS/HR MUNITS/MIN	MG/HR MG/MIN MCG/HR MCG/MIN MG/KG/HR MG/KG/MIN	MCG/KG/HR MCG/KG/MIN CUSTOM DILUTION SINGLE DOSE MANUAL SCHEDULE AUTO SCHEDULE
VIEW SYRINGES	B-D	MONOJECT	TERUMO
VIEW DEFAULTS	DFAULT LIBRARY DFAULT PROTOCOL	DFAULT MODE DFAULT MFR	
VIEW MISC	REMOTE CONTROL LIBRARY SIZE OVERRIDE	PSI RANGE AUDIO RANGE RATE RANGE	AUTO LOCK SET BACKLITE ENABLE DB9 PORT
VIEW ALERTS	IDLE ALARM NEAR END	BOLUS COMPLETE DOSE COMPLETE	VOLUME LIMIT

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Configurable Options

The option groups and configurable options are listed here and in the table above. Each option is described in the following paragraphs. The option is displayed exactly as listed in the paragraph title unless otherwise noted.

Protocol Library Group (*VIEW LIBRARY*)

This option group displays the drug protocols that are enabled. The pump displays a ***VIEW*** (library name) prompt for each enabled protocol library. A pending ***Y*** response is also displayed. To select a library, press **CONFIRM** to accept the pending response. To skip a library, press ▲ or ▼ to change the ***Y*** to ***N*** and press **CONFIRM**.

When a library has been selected, the pump displays a ***VIEW*** (protocol name) prompt for each enabled protocol. A pending ***Y*** response is also displayed. To begin reviewing a protocol, press **CONFIRM** to accept the pending response. To skip a protocol, press ▲ or ▼ to change the ***Y*** to ***N*** and press **CONFIRM**.

For each selected protocol, the default mode (if any) is displayed in the text field (for example, ***MG/KG/HR***), and concentration, dose and rate default values (if any) are shown in their usual fields.

Press **CONFIRM** to view the default bolus size. ***BOLUS SIZE*** is displayed in the text field.

Press **CONFIRM** again to view the bolus maximum rate. ***BOLUS MAX RATE*** is displayed in the text field.

Note: Dashes are displayed whenever a default value is not specified by the protocol.

If the protocol specifies bolus prevention, ***NO BOLUS*** is displayed instead of ***BOLUS SIZE***.

If no defaults are specified by the protocol, ***ALL MODES*** is displayed when the protocol is initially selected.

Press **CONFIRM** to advance to the next protocol. When the last protocol in a library has been presented for viewing, the next ***VIEW*** (library name) prompt is displayed.

See the Auto Syringe AS50 Infusion Pump Technical Manual for instructions on creating and editing protocols.

Modes Group (*VIEW MODES*)

This option group displays the name of each enabled infusion mode. Each listing shows only the mode name (for example ***ML/HR***) in the text field. For a list of the supported infusion modes, see the “Configuration Review Table” on page 62.

Syringes Group (*VIEW SYRINGES*)

This option group displays the enabled syringe sizes for each enabled syringe manufacturer.

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For each enabled manufacturer, the pump displays a ***VIEW*** (name) prompt, where (name) is the manufacturer's name. A pending ***Y*** response is also displayed. To begin reviewing the enabled syringe sizes for that manufacturer, press **CONFIRM** to accept the ***Y*** response.

Syringe size descriptions are displayed in the text field. Press **CONFIRM** to view each additional syringe.

To skip a manufacturer, press either ▲ or ▼ to change the ***Y*** to ***N*** and press **CONFIRM**.

The available manufacturer names and sizes are listed in the "Syringe Data Tables" on page 25.

Defaults Group (*VIEW DFAULTS*)

This option group displays the default options that are enabled. The pump allows four default options: Default Library (***DFAULT LIBRARY***), Default Protocol (***DFAULT PROTOCOL***), Default Mode (***DFAULT MODE***) and Default Manufacturer (***DFAULT MFR***). The defaults enable the pump to recall the selection that was used for the previous infusion, and to provide that selection in response to the first ▼ or ▲ keypress. This feature is especially useful when a particular protocol library, protocol, infusion mode, or syringe manufacturer is likely to be used repeatedly.

Miscellaneous Group (*VIEW MISC*)

This displays the miscellaneous options that are enabled. The Miscellaneous group options are: Remote Control, Protocol Library, Size Override, Occlusion Sensitivity, Audio Range, Rate Range, Auto Lock, Backlight, and Enable DB9 Port.

Remote Control

This option allows the operator to control the pump from a remote device, such as a computer. A standard 9-pin connector (DB9) located on the rear of the pump is provided for an RS-232(C) communications link between the pump and the computer. See the "Auto Syringe AS50 Infusion Pump Programmer's Manual" for details.

Protocol Library (*LIBRARY*)

This option allows the operator to select from one or more protocol libraries containing frequently used program data. Protocols are defined by authorized personnel according to procedures detailed in the "Auto Syringe AS50 Infusion Pump Service Manual."

Size Override

SIZE OVERRIDE modifies the syringe programming process by allowing the operator to select a syringe size that differs from the size detected by the pump. Instead of a ***VERIFY XX ML*** prompt, the pump displays ***SELECT SIZE*** ▼ ▲. When ▼ or ▲ is pressed, the pump displays the syringe size that best matches the syringe. However, the operator can press ▼ or ▲ to select a different size. When **CONFIRM** is pressed to complete the syringe selection, if the syringe size selected appears different from the detected syringe size, the pump displays a ***VERIFY AGAIN*** prompt and the operator must press **CONFIRM** again to complete the selection.

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Note: To restart the syringe selection process, press **CLR** before pressing **CONFIRM** to complete syringe selection.

Occlusion Sensitivity (*PSI RANGE*)

This option sets the occlusion detection system operating range. Three choices are available: ***H*** (Highest back pressure), ***M*** (Medium setting), ***L*** (Lowest back pressure). For more details see the “Auto Syringe AS50 Infusion Pump Technical Manual.”

Audio Range

The audio volume level can be configured for: ***H*** (High) or ***L*** (Low). The recommended setting is ***H***. The quieter ***L*** setting should only be used in noise-sensitive environments where the infusion is constantly monitored.

Rate Range

RATE RANGE can be configured for ***H*** (High, up to 438 mL/hr), ***M*** (Medium, 120 mL/hr) or ***L*** (Low, 15 mL/hr). The maximum delivery rate will be limited to the lesser of the Rate Range option setting or the syringe maximum (see the “Syringe Data Tables” on page 25).

The minimum delivery rate is as shown in the table, regardless of the Rate Range setting.

Auto Lock

If an infusion has been programmed and the pump is in the Run state, the Auto Lock feature automatically turns on the Lock function two minutes after the last keypress.

Backlight (*VIEW BACKLITE*)

The status display backlight is lit whenever the charger is connected and the pump is powered on. The ***VIEW BACKLITE*** option turns the backlight on after a keypress when the charger is not connected. The backlight turns off automatically after a preset time period elapses (0 to 60 minutes). Press **CONFIRM** to view the current setting.

Enable DB9 Port

When this option is set to ***Y*** (yes), the standard 9-pin connector (DB9) located on the rear of the pump is enabled as the serial RS-232(C) communication link (to allow remote control operation). When this option is set to ***N*** (no), the RS-232(C) serial communication link is disabled.

Alerts Group (*VIEW ALERTS*)

This option group displays the alert and alarm options that are enabled. The Alerts group options are: ***IDLE ALARM, NEAR END ALERT, BOLUS COMPLETE ALERT, DOSE COMPLETE ALARM***, and ***VOLUME LIMIT ALARM***.

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Idle Alarm

This option enables the pump to issue a continuous audible alarm when a ***PUMP IS IDLE*** condition occurs. If the option is disabled, the pump beeps 15 times at two minute intervals when a ***PUMP IS IDLE*** condition occurs.

Near End Alert (NEAR END)

This option enables the pump to issue an alert during an infusion prior to an expected ***VOL LIMIT*** or ***EMPTY*** alarm. The option specifies the number of minutes prior to the alarm that the expected alert will be issued and the number of beeps in the alert.

The form of a Near End alert display is ***xxMIN VOL LIM***, ***xxMIN EMPTY*** or ***xxMIN*** (protocol). The value **xx** is the configured number of minutes. The first and second forms apply to impending ***VOLUME LIMIT*** or ***EMPTY*** conditions when no protocol has been selected. The third form applies to either condition when a protocol has been selected. Press **CONFIRM** to view the current settings.

Note: When an infusion is started, no ***NEAR END*** alert will occur if fewer than the configured number of minutes remain before an ***EMPTY*** or ***VOL LIMIT*** alarm is due to occur. For example, if the ***NEAR END*** alert is configured for 10 minutes and 9 minutes remains before the volume limit is reached, no ***NEAR END*** alert will occur when **START** is pressed.

Bolus Complete Alert (BOLUS COMPLETE)

This option enables the pump to issue an alert when a bolus completes.

Dose Complete Alarm (DOSE COMPLETE)

This option enables the pump to issue an alarm when a dose completes in SINGLE DOSE mode.

Volume Limit Alarm (VOLUME LIMIT)

This option applies to mL/hr and mL/min modes only. During initial programming, the pump prompts the operator to enter a volume limit value in mL. The Volume Limit feature triggers an alarm after the pump has delivered the pre-programmed volume of drug. With this option enabled, a ***NEAR END*** alert is issued when the Volume Limit will be reached within a preconfigured time period at the current rate of infusion. See “Near End Alert” on page 66.

Identifier

The Identifier is not a configuration group, but is included here for reference purposes. The Identifier is a short message (up to eight characters) that is displayed for three seconds following the Lamp Test. The Identifier can be created or edited during the pump configuration process.

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Terminating Configuration Review

When the last configuration group option has been reviewed, the pump automatically restarts the Lamp Test, as if it had just been turned on.

To cancel Configuration Review at any time, turn the pump off.

Custom Configuration

The pump can be reconfigured as often as desired, to select features that best suit the needs of the healthcare facility.

If there is any question regarding the pump's current configuration or applicability for a particular clinical application, the operator and healthcare professionals should verify that the settings are appropriate.

While no special tools are needed, the configuration should be changed only by authorized personnel.

Factory Standard Configuration

The factory standard configuration is:

Protocol Library:	See the chart on the following page.	
Modes:	ML/HR SINGLE DOSE MCG/MIN	MCG/KG/MIN MCG/KG/HR
Manufacturers and Sizes:	B-D 1, 3, 5, 10, 20, 30, 60 mL Plastic Monoject 1, 3, 6, 12, 20, 35, 60 mL Terumo 1,3,5,10, 20, 30, 60 mL	
Defaults:	All enabled	
Misc:	PSI RANGE = M (Medium) AUDIO RANGE = H (High) RATE RANGE = H (High) BACKLITE = 2 MINUTES LIBRARY=N	
Alerts:	IDLE ALARM enabled MINALERT= 10, 5 (10 Minutes, 5 Beeps) DOSE COMPLETE enabled VOLUME LIMIT enabled	

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Protocol Libraries

Library Name	Drug Name	Protocol Name	Default Mode	Default Concentration (mg/mL)	Bolus Allowed	NONE Protocol Selection Option
ANALGESC	Alfentanil	***ALFENTAN***	mcg/kg/min	0.05	No	Yes
	Remifentanil	***REMIFENT***	mcg/kg/min	0.05	No	
	Sufentanil	***SUFENTAN***	mcg/kg/hr	0.05	No	
ANES-HYP	Propofol	***PROPOFOL***	mcg/kg/min	10	No	Yes
CARDIO	Dobutamine	***DOBUTAMI***	mcg/kg/min	5	No	Yes
	Dopamine	***DOPAMINE***	mcg/kg/min	3.2	No	
	Isoproterenol	***ISOPROTE***	mcg/min	0.004	No	
	Nitroglycerine	***NITROGLY***	mcg/min	0.4	No	
	Nitroprusside	***NITROPRU***	mcg/kg/min	0.2	No	
	Norepinephrine	***NOREPINE***	mcg/min	0.004	No	
MUSRELAX	Atracurium	***ATRACURI***	mcg/kg/min	0.5	No	Yes
	Mivacurium	***MIVACURI***	mcg/kg/min	2	No	
	Rocuronium	***ROCURONI***	mg/kg/min	10	No	
	Succinylcholine	***SUCCINYL***	mg/min	2	No	
	Vecuronium	***VECURONI***	mcg/kg/min	0.2	No	

For NONE Library Selection Option, see “Using Protocols” on page 32.

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Pump Maintenance

Charging the Battery

The battery charger cord plugs into the bottom of the pump.

Note: The plug and receptacle are shaped to fit only one way. DO NOT force the plug into place.

For the best battery operating time, the battery should be charged for at least 16 hours before using the pump. Disconnect the charger if the pump is not to be used within the next 72 hours. Prolonged overcharge and high temperature shorten the battery operating time and service life.

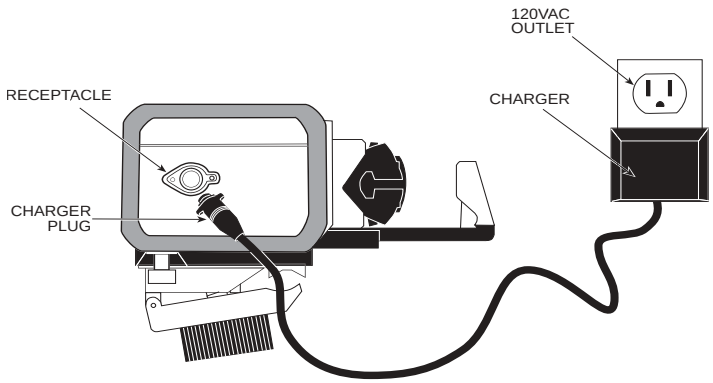
The battery voltage may be displayed by pressing **CONFIRM** briefly during the Lamp Test, or by pressing **CONFIRM** after the pump has been programmed.

Note: Battery voltage display is only an approximate indication of the battery's remaining charge. If the battery voltage is less than 6.1 volts, or is dropping rapidly, assume that the charge remaining in the battery is minimal. Recharge the battery.

Do not charge or store the pump in direct sunlight, or under excessively warm conditions.

Replacement of the battery every 16 months is recommended for optimal pump performance.

⚠ **Use only "900 Series" chargers or other accessories that are labeled specifically for use with Auto Syringe AS40A or AS50 Series Infusion Pumps. The standard battery charger (USA) is Model #C-AS40-01-900.**



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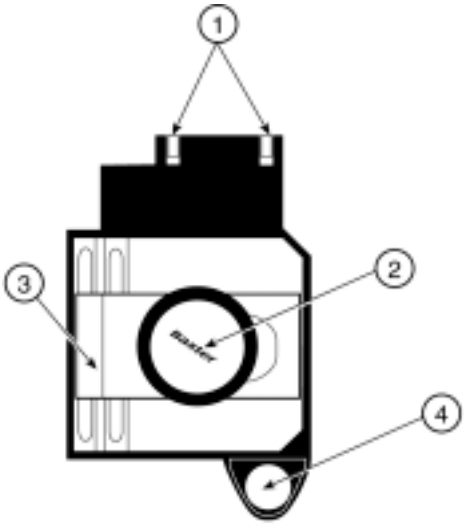
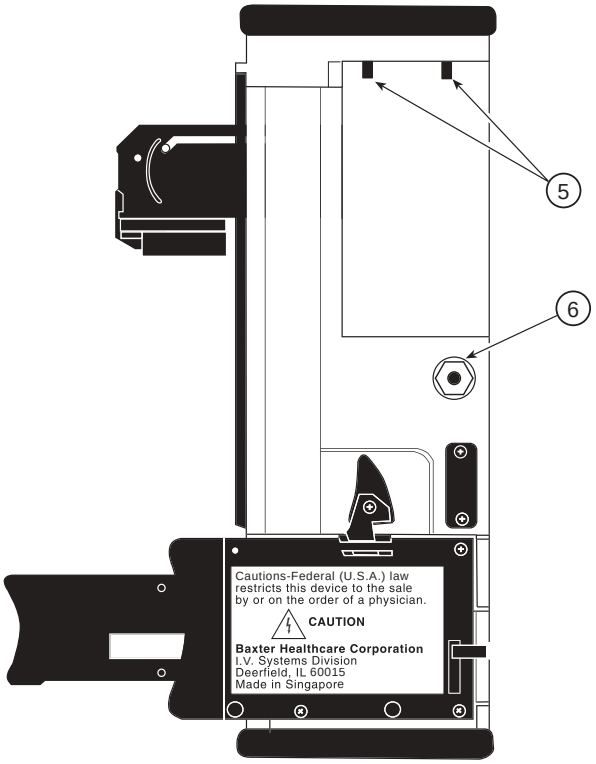
IV Pole Clamp





The pump is supplied with a detachable, adjustable pole clamp which allows it to be mounted to a standard vertical IV pole. The pole clamp can also be adjusted to allow the pump to be used on a horizontal pole.

To attach the pole clamp to the pump, first slide the clamp in place, so that the MOUNTING PIN CUTOUTS (1) on the clamp engage the MOUNTING PINS (5) built into the rear of the pump. Tighten the MOUNTING SCREW (4) into the threaded RECESS (6) just below the battery cover. Tools are not required for this operation.

The JAW (3) clamps the pump to the IV pole. Turn the KNOB (2) counterclockwise to open the jaw, and clockwise to close it. Tighten the knob by hand only. Do not use tools to tighten the knob.

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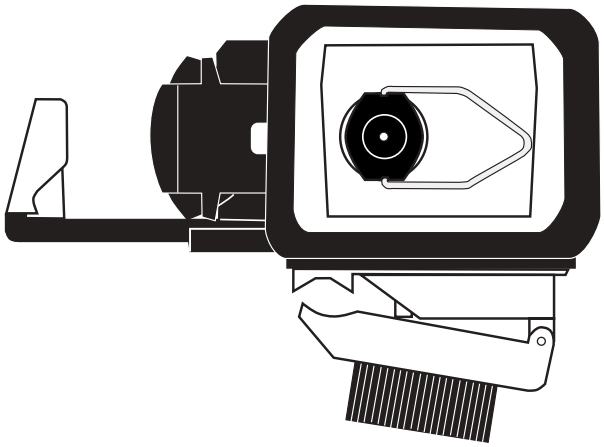
IV Pole Loop

The pump includes an IV pole loop built into the top of the pump. This loop may be swiveled as required, or folded down and out of the way when not in use.



Cleaning

All the external moving parts must be kept clean of sticky films and other foreign substances.

If spillage onto external surfaces occurs, clean the surfaces immediately by the method described below.

Routine Cleaning and Disinfection Techniques

Clean or disinfect the exterior of the device with a soft cloth or cotton swabs, sparingly dampened with any of the recommended cleaning agents listed below. Remove the rubber bumpers and clean or disinfect them separately.

Remove residual cleaner or disinfectant from all accessible surfaces with a soft cloth or cotton swabs sparingly dampened with water, and allow to dry before replacing the rubber bumpers.

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Acceptable cleaning or disinfecting agents are:

Cleaner	Manufacturer
Soapy water	Various
Isopropyl alcohol	Various
10% solution of chlorine bleach and water	Commercially available
ASCEND germicidal detergent	Huntington Professional Products
Cidex Formula 7 sterilizing and disinfecting solution	Johnson & Johnson
LpHSE, Septisol germicidal detergents	Steris Corporation
TOR, Hi-Tor Plus germicidal detergents	Huntington Professional Products

Note: Follow the manufacturer's dilution instructions for concentrated cleaning and disinfecting agents.

Recommendation of the above cleaning or disinfecting agents is based on their compatibility with the materials of which the pump is constructed. No representation is intended as to the effectiveness of any cleaning agent.

Surfaces to be disinfected must be free of gross (visible) foreign matter. Cleaning the device before disinfection is recommended.

Some surfaces are not accessible with the above method. If spillage has occurred onto inaccessible surfaces or into the mechanism, the device should be Service Cleaned as soon as possible. Service Cleaning methods are described in the Auto Syringe AS50 Infusion Pump Service Manual.

Attempts to clean or disinfect internal parts, autoclaving or sterilization by ethylene oxide gas will damage the pump and void the warranty.

Do not use the following chemicals on the device, as they will damage the front panel: acetone, acetoaldehyde ammonia, benzene, hydroxytoluene, methylene chloride, and ozone, Do not use cleaners containing n-alkyl dimethyl ethylbenzyl ammonium chloride unless they appear in the list of recommended cleaners in the Pump Maintenance section of this manual.

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Conditions Requiring Service Cleaning

Service cleaning is a procedure for removing foreign matter from areas that are not accessible through routine cleaning methods. Service cleaning must only be performed by qualified individuals. Instructions for service cleaning may be found in the Auto Syringe AS50 Infusion Pump Service Manual.

Conditions which require service cleaning include:

- Spillage into the pumping mechanism, or into the barrel clamp, flange clamp, or plunger driver mechanism.
- Accumulation of foreign matter in areas not accessible to routine cleaning.
- Excessive syringe-related alarms or alerts, such as ***CHECK SYRINGE, CHECK PLUNGER, CHECK FLANGE***, or ***CHECK BARREL***.
- Sticking of the plunger driver, the barrel clamp, or flange clamp.

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Periodic Maintenance

Daily Check

This Daily Check should be performed prior to programming an infusion. If the pump fails any part of the Daily Check, take it out of service.

1. Before using the pump, check for slippage of the plunger driver by applying gentle back pressure.
2. Check the plunger driver for free travel through its full range.
3. Check the barrel clamping mechanism for proper locking, and check that it opens and closes freely when either barrel clamp release is pressed.
4. Check that the plunger assembly opens freely to its full travel and returns to a fully closed position without assistance.

If connecting the charger, make sure that the charger plug and socket are clean and fully engaged, and that the **ON CHARGE** light is lit when the charger is plugged in.

Battery Replacement

In general, the service life of rechargeable batteries is based on many factors, including construction, size, usage, frequency of charging and discharging, and depth of discharge prior to recharge. To minimize the chances of experiencing a problem with rechargeable batteries, it is advisable to replace them before their service life is expended.

Baxter advises that pump battery replacement be made part of a regularly scheduled maintenance program. Baxter recommends that the AS50 Pump's rechargeable battery be replaced every 16 months.

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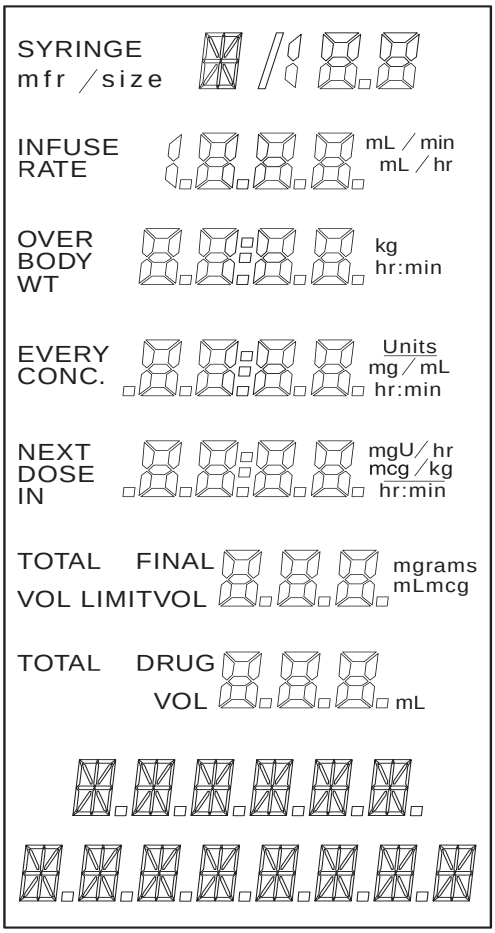
Display, Battery, and Syringe Sensor Check



1. Be sure that no syringe is mounted, and that the barrel clamp is closed.
2. Press and hold the **STOP** key during the normal power-up Lamp Test. Compare the display to the illustration. Verify that all annunciators, decimal points and digits are legible.
3. Be sure that all lights on the Status Panel light up during the Lamp Test.

Note: If the charger is plugged in, the **ON CHARGE** light will be on before, during and after the lamp test.

4. Release the **STOP** key.

Note: If ***CHECK BARREL, CHECK FLANGE*** or ***CHECK PLUNGER*** is displayed, one of the syringe mounting sensors may be malfunctioning. Make sure the plunger rod, flange and barrel capture mechanisms are free.

Turn the pump off and back on again. If the error message is repeated, remove the pump from service.

Keypad Check

1. After the pump completes the power-up Lamp Test, press every key except ▲, ▼, and **CONFIRM** in any order, one key at a time. Each keypress should result in a short beep.
2. Press any two (or more) keys simultaneously. There should be no response.
3. Press and hold any key (except ▲, ▼, **START, STOP,** and **CONFIRM**). There should be only one beep, no matter how long the key is held down.
4. Press and hold any key (except ▲, ▼, **START, STOP,** and **CONFIRM**), then press any other key. There should be no response to the second keypress.
5. Press and briefly hold down **START** and **STOP**, one at a time. The pump should sound repeated beeps while each key is held down. Holding down **START** for a prolonged period of time will cause a failsafe alarm.

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Battery Voltage Check

Note: Battery voltage display is only an approximate indication of the battery's remaining charge. If the battery voltage is less than 6.1 volts, or is dropping rapidly, assume that the charge remaining in the battery is minimal. Recharge the battery.

To display the battery voltage, press **CONFIRM** after the pump is fully programmed. The battery voltage should be more than 6.1 V if the pump is to be operated on battery power. A charged battery displays a battery voltage of approximately 7.0 volts.

In Case of Difficulty

Check the IV extension set carefully to be sure the tubing is not pinched, and that there are no obstructions to prevent proper fluid flow.

Problems associated with a particular syringe size or manufacturer are likely to be caused by variations in syringe dimensions. Typical symptoms are an inability to completely empty certain syringes, and ***LINE OCCLUDED*** alarms when the syringe becomes empty.

If you apply tape, paper stickers, or labels to the syringe, the apparent diameter of the syringe barrel may increase, which can impair the accuracy of the Syringe Recognition system.

Syringe Recognition problems may be caused by improperly mounted syringes. Excess clamping force can crush the syringe barrel, which results in an erroneous barrel diameter reading.

Frequent ***CHECK BARREL*** messages may be caused by improperly centering the syringe in the barrel clamp cradle.

If the pump fails to operate as described, contact the Baxter Healthcare Corporation Andover Service Center for assistance at:

1-800-343-0366 - Customer Service

1-800-634-4602 - Technical Service

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Alerts and Alarms

The pump notifies the operator when important conditions occur:

- Alert:

  A condition has occurred which requires operator attention. The following indications occur:

  - The pump continues to operate
  - The **ALERT** light flashes
  - The pump beeps
  - The front panel and status lights may display additional information

- Alarm:

  Immediate action is required in order to proceed with operation. The following indications occur:

  - The pump stops delivering the infusion
  - The **ALERT** light flashes
  - The pump beeps
  - The front panel and status lights may display additional information

- Failsafe Alarm:

  A malfunction has occurred that could affect the safe operation of the device. The pump goes into a “failsafe shutdown.” The following indications occur:

  - The pump stops delivering the infusion and cannot be restarted. The infusion must be reprogrammed after the problem is corrected.
  - The **SYSTEM** light is on continuously
  - The pump beeps
  - The front panel and status lights may display additional information
  - The pump must be turned off and back on to clear the alarm

If any of the aforementioned conditions occur, refer to the charts on the following pages for instructions on correcting the alert or alarm condition.

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Alerts

Message	Cause	Correction
BOLUS COMPLETE (may be accompanied by 2 beeps and flashing **ALERT** light)	The bolus has completed.	None required.
CHARGE IS LOW (10 beeps, flashing **BATTERY** light)	The battery needs charging. If a charger is not connected, or is not charging the battery, this alert repeats every 15 minutes.	Connect the charger. When the battery charge reaches the normal operating range, the alert self-cancels. If the battery voltage is very low, the alert may repeat once or twice after the charger is connected.
CHECK BARREL (single beep)	The barrel clamp is not fully closed on the syringe barrel, or the syringe is not properly seated in the cradle.	Make sure the syringe is centered in the barrel clamp cradle, and that the syringe flange is in the barrel clamp flange slot. To ensure proper seating, use the heel of the hand to press the barrel clamp firmly against the syringe. Motor movement is not allowed until the syringe is properly mounted.
CHECK FLANGE (single beep)	The syringe flange is not seated in the flange slot.	Remove the syringe and remount it. Make sure the syringe is centered in the barrel clamp cradle, and that the syringe flange is in the barrel clamp flange slot. To ensure proper seating, use the heel of the hand to press the barrel clamp firmly against the syringe. Motor movement is not allowed until the syringe is properly mounted.
CHECK PLUNGER (single beep)	The plunger capture mechanism has not captured the syringe plunger.	Grasp the finger grip on the plunger driver and pull it all the way out. Slide the driver down until it contacts the syringe plunger and push the driver in firmly. Motor movement is not allowed until the syringe is properly mounted.
CHECK SYRINGE (single beep and Standby light flashes)	At least two of the three syringe mounting points (flange, barrel, plunger) are not correctly positioned.	Check flange, barrel, and plunger, and ensure that they are mounted correctly. Motor movement is not allowed until the syringe is properly mounted.
DATA MISSING (single beep)	**START, PURGE**, or **BOLUS** was pressed when the program information is incomplete.	Enter the additional data required.
EMPTY LIBRARY (single beep)	The selected protocol library contains no protocols.	Select a different library.
FINISH EDITING (single beep)	Pressing **START, PURGE**, or **BOLUS** while a field is open for editing.	Complete the editing process.

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Message	Cause	Correction
KEYPAD LOCKED (single beep)	Pressing a key while the Lock function is active.	Press **LOCK** to unlock the keypad.
LOAD SYRINGE (single beep)	Attempt to start an infusion without a syringe in place. All three syringe detection sensors have failed.	Mount a syringe after manually purging. If alert continues to occur, have the pump serviced.
NO LIBRARY (single beep)	***VIEW LIBRARY*** was selected and no libraries exist.	Press **CONFIRM** to proceed to ***VIEW MODES*** prompt.
NO LIBRARY IS ENABLED (single beep)	***VIEW LIBRARY*** was selected and no libraries are enabled.	Press **CONFIRM** to proceed to ***VIEW MODES*** prompt.
NOT ALLOWED (single beep)	The **BOLUS** key was pressed when the bolus feature is not allowed by the selected protocol.	Use the ***NONE*** protocol library selection or the ***NONE*** protocol selection (if available) if the bolus feature is required.
OUT OF RANGE (single beep)	No bolus is possible for the current combination of syringe, body weight, and drug concentration.	Use a different syringe or drug concentration if the bolus feature is required.
PUMP IS IDLE (15 beeps and ALERT light flashes)	The pump has been in Standby state for at least 2 minutes. Also occurs if there is no keypress within 15 seconds after the infusion is stopped.	The alert is self-cancelling. The Lock function suppresses the audio portion of this alert. Note: If the keypad is locked, there will be no beeps, but the ***PUMP IS IDLE*** message will still appear.
PUMP LIMIT (single beep)	Attempting to program a value outside the pump's acceptable range.	The pump displays the nearest acceptable value. Press **CONFIRM** to accept displayed value, or enter a different value and press **CONFIRM**.
SIZE MISMATCH (single beep)	The detected syringe size is different from the programmed size.	Check to be sure the correct manufacturer has been programmed. Press **CLR** if necessary and reprogram the syringe manufacturer and size.
SIZE UNKNOWN (single beep)	The pump cannot identify the syringe size for the selected manufacturer.	Check to be sure the correct manufacturer has been programmed. Ensure that the barrel clamp is fully closed. Press **CLR** if necessary and reprogram the syringe manufacturer and size.
USE DIGITS (single beep)	Attempt to use ▲ or ▼ to initialize a field containing dashes.	Use digit keys instead.

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Message	Cause	Correction
VERIFY AGAIN (single beep)	The detected syringe size is different from the programmed size.	Press ▲ or ▼ to change size or **CONFIRM** to complete size override.
▲▼ ***IN USE*** (single beep)	An attempt was made to use digit keys to edit a number that was modified with an arrow key.	Continue programming with the arrow keys, or clear the field and reprogram it with digit keys.
<xx MIN EMPTY or ***<xx MIN VOLUME LIMIT*** or ***<xx MIN*** **(protocol)** (configurable number of beeps. **ALERT** light flashes until syringe is empty or volume limit is reached)	At the present rate of infusion, approximately xx minutes remain until the syringe will be empty or the volume limit will be reached. If a protocol has been selected, the protocol name will be displayed instead of ***END*** or ***VOLUME LIMIT***.	Pressing any key silences the audio portion of the alert. The alert is reset when a filled syringe is installed, or when the plunger driver is moved back. **Note:** Since this function is sensitive to variations in syringe dimensions, the exact timing of this alert may vary.

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Alarms

Message	Cause	Correction
CHECK BARREL (continuous beeps and flashing **ALERT** light)	During motor movement the pump has detected that the barrel clamp is not fully closed on the syringe barrel, or the syringe barrel is not properly seated in the cradle.	Pressing any key silences the audio portion of the alarm. Make sure the syringe is centered in the barrel clamp cradle, and that the syringe flange is in the barrel clamp flange slot. To ensure proper seating, use the heel of the hand to press the barrel clamp firmly against the syringe. Motor movement is not allowed until the syringe is properly mounted.
CHECK FLANGE (continuous beeps and flashing **ALERT** light)	During motor movement the pump has detected that the syringe flange is not seated in the flange slot.	Pressing any key silences the audio portion of the alarm. Remove the syringe and remount it. Make sure the syringe is centered in the barrel clamp cradle, and that the syringe flange is in the barrel clamp flange slot. To ensure proper seating, use the heel of the hand to press the barrel clamp firmly against the syringe. Motor movement is not allowed until the syringe is properly mounted.
CHECK PLUNGER (continuous beeps and flashing **ALERT** light)	During motor movement the pump has detected that the plunger capture mechanism has not captured the syringe plunger.	Pressing any key silences the audio portion of the alarm. Grasp the finger grip on the plunger driver and pull it all the way out. Slide the driver down until it contacts the syringe plunger. Push in firmly. Motor movement is not allowed until the syringe is properly mounted.
CHECK SYRINGE (continuous beeps and flashing **ALERT** light)	At least two of the three syringe mounting points (flange, barrel, plunger) are not correctly positioned.	Pressing any key silences the audio portion of the alarm. Check flange, barrel, and plunger, and ensure that they are mounted correctly. Motor movement is not allowed until the syringe is properly mounted.
DOSE COMPLETE (continuous beeps and flashing **ALERT** light)	(Single Dose Infusion Mode only) The programmed dose has been delivered.	Pressing any key silences the alarm.
DOSE DUE (continuous beeps and flashing **ALERT** light)	(Manual Schedule Infusion Mode only) The ***NEXT DOSE IN*** timer has reached 0:00, and the next dose is due to be delivered.	Pressing any key silences the audio portion of the alarm. Press **START** to deliver the scheduled dose.

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Message	Cause	Correction
EMPTY or ***EMPTY* (protocol**) (continuous beeps and flashing **ALERT** light)	The syringe is empty.	Pressing any key silences the audio portion of the alarm. Release and slide the plunger driver back at least 1.6 inches (4 cm) to reset the alarm. **Note:** due to variability in syringe dimensions, a ***LINE OCCLUDED*** alarm may occur before the ***EMPTY*** alarm. Option: The infusion may be restarted without resetting ***EMPTY*** condition. The pump will continue to display ***EMPTY*** and **ALERT** light will continue flashing. The infusion will continue until **STOP** is pressed or a ***LINE OCCLUDED*** alarm occurs.
FINISH EDITING (continuous beeps and flashing **ALERT** light)	The Rate or Dose field is being edited while an infusion is in progress, and there has been no keypress for 15 seconds.	Pressing any key silences the audio portion of the alarm. Complete the editing operation.
LINE OCCLUDED (continuous beeps and flashing **ALERT** light)	There is an occlusion, line constriction, or other condition that causes excess plunger force.	The alarm automatically stops the pump. Pressing any key silences the audio portion of the alarm. Check for empty syringe, kinked tubing, clogged catheter, etc. Check for foreign material preventing movement of the pump mechanism. RELIEVE RESIDUAL SYRINGE PRESSURE BY RELEASING THE PLUNGER DRIVER. If the plunger driver is not released, an unintentional bolus may occur when the blockage is cleared. The message clears when the infusion is successfully restarted.
PUMP IS IDLE (continuous beeps and flashing **ALERT** light)	The pump has been in Standby state for at least 2 minutes. Also occurs if there is no keypress within 15 seconds after the infusion is stopped.	Pressing any key silences the audio portion of the alarm. The Lock function suppresses the audio portion of this alarm. **Note:** If the keypad is locked, there will be no beeps, but the ***PUMP IS IDLE*** message still appears.
VOLUME LIMIT (continuous beeps and flashing **ALERT** light)	The programmed volume limit has been reached.	Pressing any key silences the audio portion of the alarm. Restarting the pump (by pressing **START** or initiating a bolus) resets the Volume Limit field.

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Failsafe Alarms

Failsafe alarms occur only when proper operation cannot be assured. The infusion cannot be restarted, and must be reprogrammed after the problem has been corrected. The pump must be turned off to clear the alarm.

Message	Cause	Correction
(*ERROR CODE*) (continuous two-tone audio, **SYSTEM** light on)	An internal error has been detected.	Repair is required. Make a note of all displayed error codes and the conditions prior to the error. Take the pump out of service. **Note:** In some cases, there may not be a legible error code display.
CHARGE DEPLETED (continuous two-tone audio, **SYSTEM** and **BATTERY** lights on)	The battery voltage is below minimum operating level.	Connect the charger and recharge the battery for a minimum of 16 hours.
FUSE FAILURE (continuous two-tone audio, **SYSTEM** and **BATTERY** lights on)	Fuse self-test has detected a fuse failure.	Repair is required. Take the pump out of service.
POWER FAULT (continuous, two-tone long beeps, **SYSTEM** and **BATTERY** lights on)	The pump's internal power supply is out of tolerance, or there is a fault in the charger.	Repair is required. Take the pump and charger out of service.

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Warranty and Service Information

Warranty

Baxter Healthcare Corporation (“Baxter”) warrants that the equipment shall be free from defects in material and workmanship when delivered to the original purchaser. Baxter's sole obligation shall be limited to repair or replacement at Baxter’s option and expense, of the defective part or unit for a period of one year following the date of initial delivery. The applicable period for batteries is limited to a period of 12 months following the date of initial delivery.

The warranty extends only to the original purchaser and is not assignable or transferable, and shall not apply to auxiliary equipment or disposable accessories. Baxter’s commitment to repair or replace the product will be null and void if this product is used contrary to the directions for use contained in the labeling. Baxter will assume no responsibility for incidents which may occur if the product is not used in accordance with product labeling.

THERE ARE NO OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTY AND ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXTEND BEYOND THE DESCRIPTION OF THE PRODUCT AND THOSE EXPRESSLY SET FORTH IN ITS LABELING. In no event shall Baxter be responsible for incidental, consequential, or exemplary damages. Modification, alteration, recalibration or abuse, and service by other than a Baxter authorized representative may void the warranty.

Service Information

While under Baxter Warranty, Service Agreement (optional), or lease agreement, the instrument must not be opened by unauthorized personnel.

For service and repair information for this product, call the Baxter Healthcare Corporation Andover Service Center at 1-800-343-0366 (Customer Service) or 1-800-634-4602 (Technical Service).

Shipping costs for all units returned to Baxter shall be paid for by the customer. The unit must be packed in its original container or in a container that will provide adequate protection during shipment. To ensure prompt return, the Baxter Healthcare Corporation Andover Service Center must be notified before shipping any unit for repair. When calling, please be prepared to provide the product code number and serial number of the unit. A service authorization number will be issued and should accompany all communications. A brief written description of the problem should be attached to the instrument when it is returned for service.

Baxter will not be responsible for unauthorized returns or for units damaged in shipment due to improper packing.

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